A REPORT ON

AIR QUALITY MONITORING RESULTS IN NEW BRUNSWICK

FOR THE YEAR 2005

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AIR QUALITY MONITORING RESULTS

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EXECUTIVE SUMMARY

This report summarises air quality monitoring data in New Brunswick for 2005. The report is intended to provide a convenient summary of air quality results for general public information, with emphasis on air quality assessment in relation to existing air quality standards and objectives. Long-term trend data are also presented for representative sites. In New Brunswick, air quality objectives are established for carbon monoxide, sulphur dioxide, hydrogen sulphide, nitrogen dioxide and total suspended particulate.

Air quality has been monitored in New Brunswick since the 1960s, when several short-term studies were carried out in Saint John. The emphasis on air monitoring has steadily increased over the years. Air contaminants presently covered by provincial objectives were measured at 59 sites in 10 regional monitoring networks across the province during 2005. Acid rain was measured at 13 additional sites. Inhalable particulate matter (PM_{10}), volatile organic compounds (VOCs) and mercury in air were also monitored at some locations, although no standards were in effect in New Brunswick for these substances in 2005.

This report presents summary statistics from all monitoring sites in the province, with additional statistical data (in chart form) in an Appendix. Details are also provided on the quality assurance procedures used in the provincial air quality system.

During 2005 there were no exceedances of objectives for nitrogen dioxide or carbon monoxide at any of the provincial monitoring sites (ten sites for nitrogen dioxide and three for carbon monoxide). Exceedances for sulphur dioxide were lower in Saint John and Grand Lake than in 2004, and very infrequent in other networks. Ozone exceedances occurred on two days, affecting 3 of 15 stations.

A few elevated values of total reduced sulphur occurred in Saint John. TRS values were lower in the Miramichi area than in 2004. For particulate matter, there were no exceedances for PM_{10} in Saint John. For $PM_{2.5}$, results at all monitoring sites were below the Canada-wide Standard. Total VOC concentrations in 2005 were slightly higher at both Forest Hills and Champlain Heights, compared with 2004.

An examination of air quality trends at sites with long records indicates that since the late 1970s and 1980s, air quality has improved for all pollutants currently being measured, with the possible exception of ground level ozone, for which no clear trend is apparent. Levels of sulphur dioxide, total suspended particulate, and PM_{10} have fallen significantly over the past 15-20 years. Levels of carbon monoxide and nitrogen dioxide have also generally fallen.

Although acid deposition has generally declined since the early 1990s, acid rain impacts continue to be of concern in the province, particularly in south-western districts. Sulphate in precipitation, a key indicator of acid rain, was the lowest since 2003.

During 2005, a mobile air quality monitoring vehicle was sited in Lamèque, in the Acadian Peninsula, from June to October, and near St. Stephen, from October to December, to investigate conditions in locations not covered by permanent monitoring sites. Notable results included no exceedances of standards at the St. Stephen location. At Lamèque, fewer incidents of elevated total reduced sulphur were seen in comparison with previous years.

Feedback

We are interested in your opinions and feedback on this report. All suggestions will be considered, and if possible, incorporated in future reports. You may contact the Sciences and Reporting Branch at (506) 457-4844, by fax at (506) 453-2265 or e-mail Robert Hughes at robert.hughes@gnb.ca with any comments.

Acknowledgements

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Thanks to Randy Piercey, Don Murray, Matthew Dickson, Don Grass and Mallory Gilliss for reviewing and providing comments on the report, and to Heather McCracken for help with data analysis.

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1. INTRODUCTION

This report summarises air quality information gathered during 2005 at monitoring locations across New Brunswick. A summary of data from the provincial acid rain network is also included. This report focuses on ambient (i.e. outdoor) air, which provides an indication of environmental quality in terms of air pollution.

Information on air quality standards and objectives, sources and effects of air pollutants, and climate change and air quality may be found on the Department of the Environment web site, at:

http://www.gnb.ca/0009/0001-e.asp

2. MONITORING NETWORKS

Compliance with air quality objectives or regulatory standards is determined by monitoring. Because exposure to many air pollutants can occur at any time, most are monitored continuously, although particulates have been an exception. However, new technology now allows continuous measurement. As a result, continuous particulate measurements are gradually becoming more widespread and available.

Monitoring locations are selected so that they will provide information which is representative of the surrounding area. In cases where there is a known pollutant source, monitors are often distributed around it in locations where the impact is expected to be greatest. Such locations are typically selected based on the results of computer dispersion models. These are computer programs which simulate the behaviour of plumes, or discharge streams of gases as they are released from smokestacks. Such models take into account the complete variety of weather conditions which may be experienced in the area where the stack is located, as well as the nature of the local landscape.

In New Brunswick, large industrial emission sources, such as electricity generating stations or pulp mills, are legally required by DENV to carry out ambient air quality monitoring as prescribed in their Approvals to Operate under the Clean Air Act. Such Approval conditions also detail the required equipment specifications, locations and reporting frequency. In such cases, the monitoring equipment and maintenance procedures are checked periodically by DENV staff or independent auditors, to ensure the required standards for operation and technical accuracy are being met.

In the case of air pollutants which are transported long distances, and which may be found in rural, as well as urban areas, DENV establishes and operates its own monitoring sites. The Department also maintains sites in areas where there are multiple large industrial emission sources, such as Greater Saint John. In addition to 13 provincial sites, there is one federally-operated acid rain monitoring site in New Brunswick (at Harcourt, in eastern New Brunswick). Federal support is also provided for the operation of several other air quality monitoring sites across the province (through the National Air Pollution Surveillance program).

The location of air quality monitoring sites and the main regional and local networks are shown on the following map (Figure 1). More detail on the exact location of each site is provided in the following sections.

The major industry or urban networks are identified. Filled circles on the map indicate rural ozone sites. The remainder indicate ambient monitoring locations for other substances including sulphur dioxide, nitrogen dioxide and particulates.

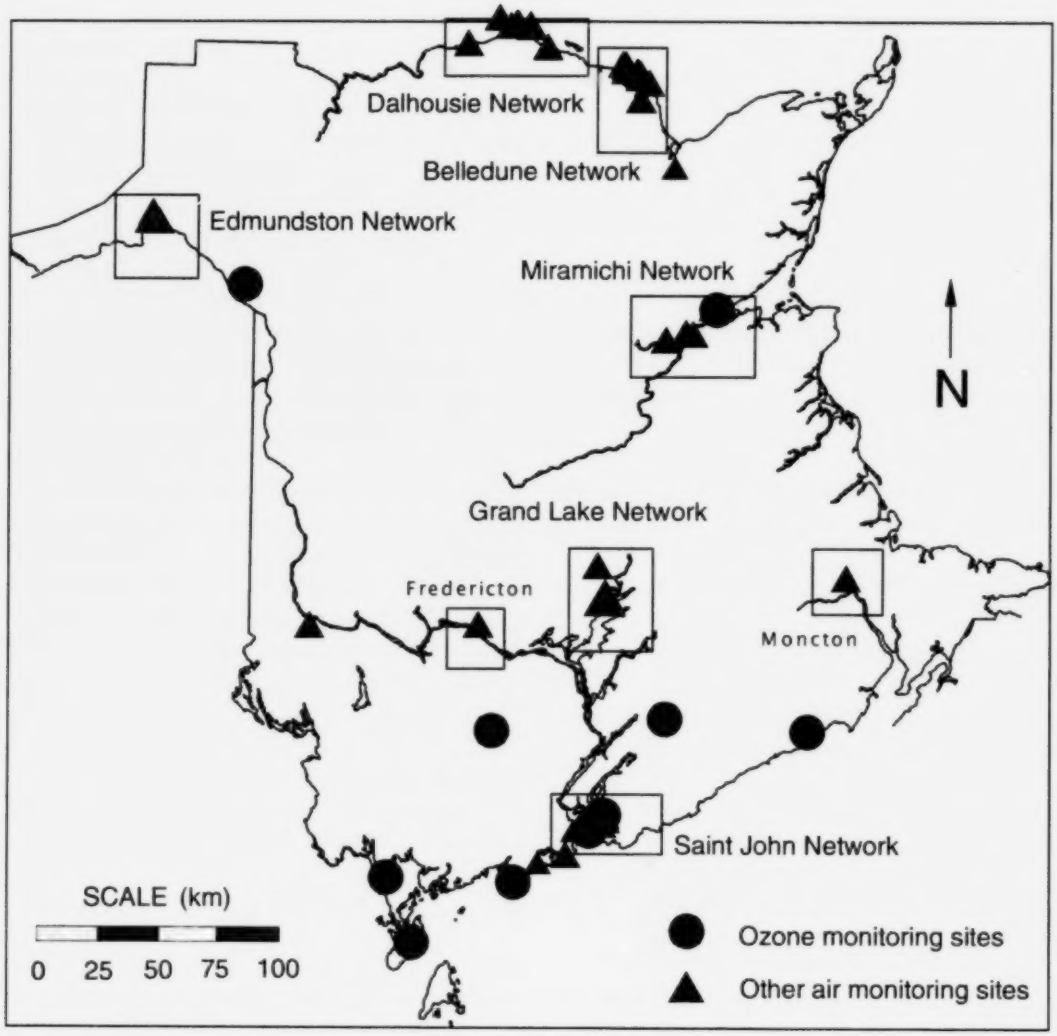


Figure 1. Locations of air quality monitoring sites in New Brunswick, 2005.

3. AIR QUALITY MONITORING RESULTS FOR 2005

Results are presented for each monitoring network in the Province. The locations of the monitoring sites are shown on regional scale maps. The numeric results are shown in tables, and further details in chart form appear in Appendix I. Explanatory notes are provided on each network, and a discussion of the results for each network is included.

A. SAINT JOHN

The Saint John area has the longest history of air quality monitoring in New Brunswick, beginning in 1961. Since that time, air quality has been monitored at more than 30 different locations in the city and surrounding area. Air quality monitoring sites which were active in 2005 (a total of 17 stations at 16 separate locations) are shown on the following maps (Figures 2 and 3). Figure 3 shows four new sites reporting for the first time in 2005, established in connection with the Coleson Cove generating station.

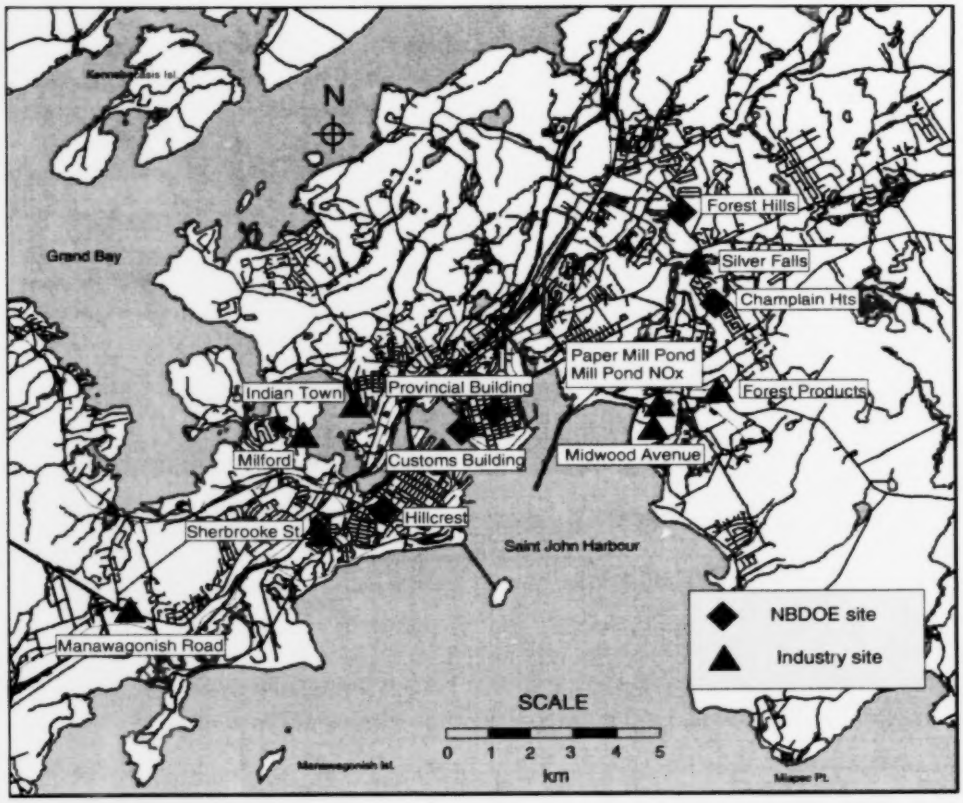


Figure 2 . Air quality monitoring sites in Saint John, New Brunswick, 2005.

Most of these sites are electronically linked to a central computer at the DENV regional office in Saint John. This system communicates with the monitors a minimum of once each hour and obtains the latest readings. These are then added to the existing data archive and some are used to prepare IQUA public information messages, as well as to determine the nature of any abatement actions required by industries if concentrations rise above pre-determined trigger points. Such episode control systems are specified in various Approvals to Operate issued to major emission sources by the Department.

On the City's west side, three monitoring sites for total reduced sulphur are operated by Irving Pulp and Paper Ltd. NB Power operates a site on the Manawagonish Road, for sulphur dioxide and PM2.5. DENV also operates a site at the Hillcrest Baptist Church off Lancaster Avenue, at which sulphur dioxide, total reduced sulphur, ozone and particulate matter are monitored. In east Saint John, four sites for sulphur dioxide and one for $PM_{2.5}$ particulate matter are operated by Irving Oil Ltd., as required by the company's operating approval, and results are sent electronically to the Department's data system.

To the west outside the city, NB Power maintains sites at Grand Bay-Westfield (SO_2), Musquash (SO_2) and Lorneville (SO_2 and $PM_{2.5}$). These sites were established in late 2004 and reported for the first full year in 2005.

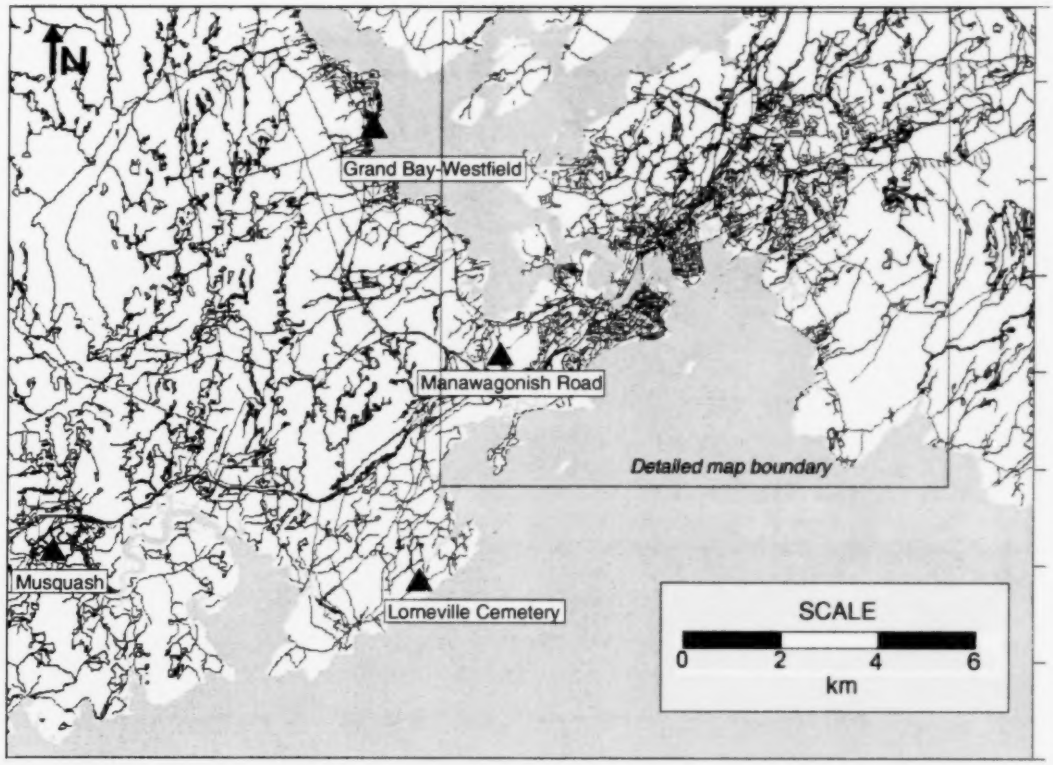


Figure 3. Locations of new NB Power Coleson Cove network air quality monitoring sites in New Brunswick, 2005.

DENV also maintains sites at Forest Hills and Champlain Heights in the eastern suburbs, and at the Customs Building and Provincial Building in the uptown area. The Customs site has monitors for ozone, sulphur dioxide, nitrogen dioxide and carbon monoxide. At Forest Hills there are monitors for ozone, sulphur dioxide, nitrogen oxides, PM_{10}, $PM_{2.5}$ and volatile organic compounds (VOCs). At the Champlain Heights School, sulphur dioxide, total reduced sulphur, nitrogen dioxide, VOCs and $PM_{2.5}$ are measured.

A.1 Carbon Monoxide

This pollutant is monitored at the Customs Building site to provide data representative of the city centre. Peak hourly values in every month seldom exceeded 2.0 ppm, and were thus well below the applicable objective of 30 ppm in 2004. There were also no exceedances of the 8-h objective of 13 ppm.

A.2 Nitrogen Dioxide

There were no exceedances of the 1-hour objective of 210 ppb at any site (Forest Hills, Customs Building, Champlain Heights School or Mill Pond) in 2005. Neither were the 24-hour objective (105 ppb) or the annual objective (52 ppb) exceeded. At the Customs site, concentrations were similar to those seen in 2004. At Forest Hills, levels were similar to those in 2004. Champlain Heights generally had values similar to or slightly higher than those seen at Forest Hills, and similar to those at the Mill Pond site.

A.3 Sulphur Dioxide

Exceedances for sulphur dioxide are summarised in the following table. During 2005, the number of exceedances was similar to or lower than 2004. Most of the exceedances occurred at the Paper Mill Pond site. The annual average (12 ppb) also exceeded the objective (11 ppb) at Paper Mill Pond (renamed to Grandview West in 2006).

A.3.1 Sulphur Dioxide Episode Control

An episode control program is in place to prevent ambient sulphur dioxide reaching undesirably high levels in Saint John. Control actions are initiated by major industries in the city in response to measurements made at the fixed monitoring sites.

Exceedances of provincial objectives for SO2, 1996 -2005, Saint John

	Midwood Avenue	Sherbrooke St	Champlain Hts	Customs Building	Forest Hills	Forest Products	Hillcrest	Paper Mill Pond	Silver Falls
1-HOUR OBJECTIVE									
2005	0	0	3	0	1	0	0	135	4
2004			0	2	0	0	0	153	2
2003			1	0	1	2	0	153	10
2002			0	0	0	0	0		0
2001			1	0	0	0	0		4
2000			4	3	1	1	2		3
1999			0	0	2	4	0		0
1998			4	3	4	11	0		1
1997			0	0	4	33	9		3
1996			0	0	2	23	0		2
24-HOUR OBJECTIVE									
2005	0	0	0	0	0	0	0	331	16
2004			0	0	0	0	0	504	31
2003			47	0	23	3	0	429	117
2002			0	0	0	0	23		14
2001			4	0	0	0	0		47
2000			35	0	0	0	0		0
1999			0	0	25	25	0		0
1998			26	31	9	119	0		0
1997			47	0	7	216	59		52

As noted earlier, these control actions are made mandatory by being incorporated into the relevant Approvals to Operate issued by DENV. The episode control plans themselves are subject to continual review. DENV meets regularly with staff of the major industries in the city to review compliance in respect of sulphur dioxide.

All exceedance events are examined in detail and any shortfalls in the nature and extent of response action are addressed. DENV staff sometimes request emission control actions separate from or in addition to those specified in the response plans. Such action may be warranted due to unusual conditions, such as poor dispersion, or during periods when smog advisories are in effect.

Some of the ways in which industries respond to rising levels of sulphur dioxide include switching to lower or near-zero sulphur fuels, and reducing production rates or electricity generating rate. Response action is begun when monitored concentrations reach 80 parts per billion, approximately half the 1-hour objective of 170 parts per billion.

A.4 Particulate matter

A.4.1 PM_{10} High Volume Sampler

DENV operated a high volume sampler (modified to provide data on PM_{10}) at the Provincial Building site during 2005. As noted earlier, there is no Canadian National Objective presently in place for PM_{10}, and no provincial objective in New Brunswick. For evaluation purposes, reference is made to the standards in place in Greater Vancouver, the United States, and the State of California.

Monitoring results at the Provincial Building site were low during 2005, with no exceedances of the California/ GVRD 24-hour standard of 50 micrograms per cubic metre.

A.4.2 $PM_{2.5}$

Forest Hills - TEOM

The Canada-wide Standard for $PM_{2.5}$ is 30 micrograms per cubic metre as a 24-hour average, itself averaged over 3 years. In 2005, there were no days having a 24-hour average exceeding the 24-hour average of 30 micrograms per cubic metre.

Forest Hills - BAM

The 24-h average exceeded 30 micrograms per cubic metre on two days, June 25 and July 26. Summary statistics are shown in the table on the following page.

TEOM and BAM

Continuous monitoring of particulate matter is routinely carried out using two principal methods of measurement, referred to as TEOM and BAM.

TEOM stands for tapered element oscillating microbalance. The method senses the change in mass of a filter, mounted on a vibrating quartz rod (the tapered element).

BAM stands for beta attenuation method. This method directs a beam of beta radiation at a paper filter tape through which the air sample is drawn. The amount of weakening or scattering of the beam can be related to the particle mass on the tape.

Although both methods provide useful results, they may not be directly comparable. Detailed intercomparison of continuous particulate measurement methods is ongoing in Canada, the US, and around the world.

Champlain Heights - BAM

Results are summarised in the table on the following page. There were no days during the year having a 24-hour average exceeding the 24-h CWS guidelines of 30 micrograms per cubic metre.

A.5 Ground Level Ozone

Ozone was monitored at three sites in the city during 2005: Forest Hills, the Customs Building and in west Saint John at Hillcrest Church. During 2005 there were 4 exceedances of the 1-hour National Ambient Air Quality Objective for ozone of 82 ppb in the Saint John Network, occurring at the Customs site in June. Statistics were also calculated in reference to the Canada-wide Standard (CWS) for ozone, which is based on an 8-hour averaging period and is set at 65 parts per billion. Data and trends are shown in Figure 10, page 30. New Brunswick (and other provincial governments) have committed to be in compliance with the CWS for ozone by 2010. In the interim, CWS compliance statistics are calculated and presented for general assessment purposes.

Further details on ground level ozone follow in section 4, where additional results for all ozone monitoring sites are summarised.

Monitoring results for $PM_{2.5}$, 2005, Saint John Network				
	Forest Hills (TEOM)	**Forest Hills (BAM)**	**Hillcrest (BAM)**	**Champlain Hts (BAM)**
Annual average (micrograms per cubic metre)	4.3	8.0	11.1	6.9
98th percentile value (Canada wide standard statistic)	14.9	25.8	24.8	13.7
Days with 24-h average >30 micrograms/cubic metre	0	2	0	0
Hours with running 24-h average >30	54	63	21	0

	Exceedances of provincial objectives for Total Reduced Sulphur (TRS), Saint John, 1996-2005					
		CHAMPLAIN HTS	HILLCREST	INDIAN TOWN	MILFORD	SHERBROOKE ST
2005	1-h	2	0	0	3	0
2004	1-h	3	M	0	0	0
2003	1-h	0	0	0	0	1
2002	1-h		0	2	0	0
2001	1-h		0	0	1	9
2000	1-h		3	2	0	4
1999	1-h		1	6	0	0
1998	1-h		17	29	23	16
1997	1-h		31	10	22	0
1996	1-h		46	3	0	3
2005	24-h	0	0	0	22	0
2004	24-h	0	M	0	19	0
2003	24-h	0	0	0	0	0
2002	24-h		0	11	0	0
2001	24-h		0	0	5	684
2000	24-h		18	47	12	29
1999	24-h		20	26	0	0
1998	24-h		258	277	136	157
1997	24-h		282	89	234	0
1996	24-h		470	25	0	0
M = missing.						

A.6 Total Reduced Sulphur

Total reduced sulphur (TRS) is monitored at the Hillcrest site and at Champlain Heights (DENV) as well as three sites operated by Irving Pulp and Paper (Milford, Indian Town and Sherbrooke St.).

There were a few exceedances of objectives in 2005, at Champlain Heights in November and December, and Milford in August. Note: for evaluation of TRS data, and in the absence of a specific objective for TRS, reference is made to the provincial objectives for hydrogen sulphide. Results since 1996 are summarised in the table on the previous page.

A.7 Volatile Organic Compounds (VOCs)

VOCs have been measured at Forest Hills in east Saint John since 1992. Measurements have also been made for the same period of time at Point Lepreau, approximately 40 km southwest of the city. The Lepreau site is predominantly upwind of Saint John and serves as a control or reference site, representative of rural southern New Brunswick. In July 2000, VOC sampling was begun at Champlain Heights in east Saint John. The monitoring program for VOCs is a collaborative one between DENV and Environment Canada. DENV staff maintain the monitoring sites and set up the equipment to take samples (normally every 6 days). Environment Canada performs the analyses on the collected air samples.

Sites in Saint John collect one 24-hour sample every 6 days and the rural site at Point Lepreau collects a 4-hour sample beginning at noon, every 3 days. All samples are analysed for over 150 compounds, which include VOCs which are involved in the formation of ozone, as well as VOCs which may be of interest for other reasons. For example, they may be indicators of various kinds of industrial activity, or they may be potentially of concern in their own right (for example, substances which are known to be carcinogenic, such as benzene). Some other VOCs which are measured are found at similar concentrations regionally or even globally (such as several CFC compounds). These substances are of key interest in atmospheric research.

There are no national ambient air quality standards for VOCs in Canada. Results can be compared against guidelines published by other agencies, and examined over time to look for trends, as well as differences between sites.

The table on the following page lists results for 2005 for selected VOCs, compared with guidelines recommended by various agencies. This subset of VOCs contains compounds which have traditionally been classified as "air toxics", and which are considered potentially harmful to human health. The first line of the results table also shows the average concentration taking into account all VOCs measured at each site (total VOC).

Results from Champlain Heights were once more higher than those measured at Forest Hills. Both sites had higher concentrations of most VOCs than the Point Lepreau site.

For the selected VOCs for which guidelines could be referenced, concentrations at both monitoring sites were found to be below these targets at both sites, in most cases by a substantial margin. The annual guideline for benzene published in the United Kingdom (5 ppb) has a long-term target of 1 ppb (EPAQS, 1994, HMSO, 2000). Benzene is emitted from motor vehicles and is a component of gasoline. In Saint John, the petroleum refinery and other industries would also contribute to ambient concentrations, which were below the Swedish guideline of 1.5 ppb. This guideline has a compliance date of 2010 (Swedish EPA, 2003). Additional analysis of VOC data is included in the section on long-term trends (section 8).

2005 VOC Monitoring Results							
VOC	Max 24-h averages (ppb)		24-h guidelines (ppb)	Annual averages (ppb)			Annual Guidelines (ppb)
	Forest Hills	Champlain Hts		Forest Hills	Champlain Hts	#Point Lepreau	
Total VOC	129.7	551.1		33.2	71.8	5.99	
1,3 butadiene	0.16	0.17		0.03	0.03	0.00	1 (UK)
Benzene	1.47	3.30		0.31	0.62	0.07	1.5 (UK, (Sweden)
Toluene	2.36	5.84	63 (WHO) 106 (AB) 524 (ON)	0.45	1.35	0.33	10-100 (Sweden)
Ethylbenzene	0.41	1.15	4464 (WHO) 227 (ON)	0.07	0.27	0.02	
Xylenes	1.02	4.00	1013 (WHO) 161 (AB) 522 (ON)	0.19	0.76	0.05	
Styrene	0.04	1.19	56 (WHO) 94 (MB) 93 (ON)	0.01	0.03	0.01	
Chloromethane	0.67	0.79	3344 (ON)	0.58	0.57	0.60	
Vinyl chloride	0.00	0.00	0.4 (ON)	0.0	0.00	0.00	
1,1 dichloroethylene	--	0.02		--	0.00	--	
Dichloromethane	0.35	0.20	792 (WHO) 62 (ON)	0.06	0.07	0.38	100-250 (Sweden)
1,2 dichloroethane	0.01	0.09	159 (WHO)	0.01	0.01	0.01	100-150 (Sweden)
Carbon tetrachloride	0.11	0.10	0.4 (ON)	0.10	0.09	0.10	
1,2 dichloropropane	0.00	0.00		0.00	0.00	--	
Trichloroethylene	0.01	0.30	21 (ON)	0.01	0.01	0.01	100-200 (Sweden)
1,1,2 trichloroethane	0.00	0.00		0.00	0.00	0.00	
Ethylene dibromide	0.00	0.00	0.4 (ON)	0.00	0.00	--	
Tetrachloroethylene	0.07	0.02	34 (WHO)	0.01	0.01	0.01	
1,1,2,2 tetrachloroethane	0.00	0.00		0.00	0.00	--	
Formaldehyde	2.60	31.40	52 (ON)	0.74	3.49	--	
Acetaldehyde	1.98	5.70	274 (ON)	0.47	1.26	--	
MTBE	21.41	55.00		1.99	4.19	--	

Notes: The guidelines marked with an asterisk (*) are for a weekly period. AB =Alberta; ON = Ontario; MB = Manitoba. Sources: WHO (World Health Organisation): 1987, 1994,1996 & 1997; Swedish standards: OECD, 1995; Swedish EPA, 2003. UK standards: HMSO, 2000. Alberta, Ontario, and Manitoba : Provincial Environment Departments. # Data at Pt Lepreau are collected for 4 hours each sample day, starting at noon AST. The other sites are based on 24-h samples every 6th day.

For additional information, see also the table on page 51.

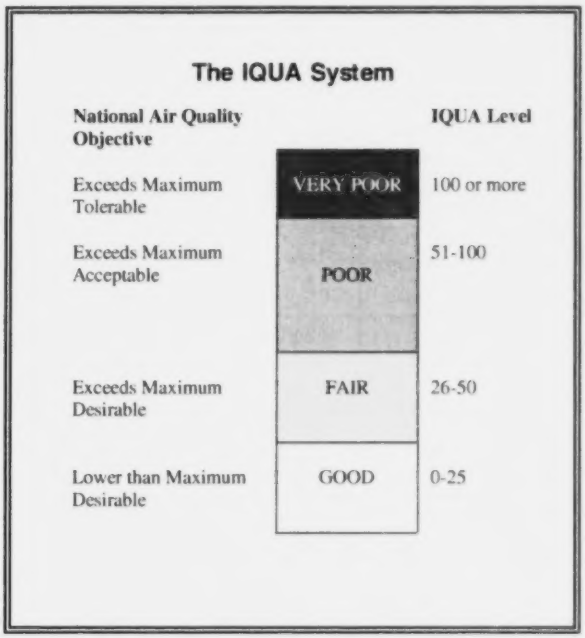
A.8 Index of the Quality of the Air (IQUA)

The IQUA system has been used in Saint John for over 25 years to help make air quality monitoring results easier to understand. Results for each pollutant measurement are expressed on a scale from 1-100, and classed as "good" (index 0 to 25), "fair" (26 to 50), "poor" (51 to 100) or "very poor" (over 100). Each of the categories is based on the National Air Quality Objectives. For example, "good" air quality indicates that pollutants are in the "desirable" range as defined by the air quality objectives. Values in the "fair" range are above the desirable, but below the acceptable objective. IQUA information is distributed daily via the DENV web site:

http://www1.gnb.ca/0355/0003/0000.asp

This web page is updated three times per day. IQUA information is also accessible by phone via recorded message (dial 636 4991 in the Saint John area). The recorded message is updated hourly.

For each hour, the IQUA index is computed for each pollutant measured at the site. The value reported is the highest of each of the individual values. For example, if two pollutants are in the "good" range and one is in the "poor" range, then the index for the hour would be reported as "poor". In addition, the pollutant responsible for determining the overall index value is usually identified.



Summary statistics are given in the following table for the three designated IQUA sites in Saint John: Customs Building (uptown), Forest Hills (east) and Hillcrest (west). The table shows the number of hours logged in each IQUA category. It is apparent that the vast majority of the time, air quality was in the "good" category during 2005 (more than 99% of the time). The percentage of hours in the "fair" range was less than 1% at all sites, and there were no hours recorded in the poor or very poor categories.

IQUA Summary 2005: Saint John Sites

	Good (0-25)	Fair (26-50)	Poor (51-100)	Very Poor (over 100)
Forest Hills	99.5	0.5	0.0	0.0
Customs	99.3	0.7	0.0	0.0
Hillcrest	99.4	0.6	0.0	0.0

B. MIRAMICHI

There are three monitoring sub-networks in the Miramichi region, one centred on the UPM pulp mill emission sources, another on NB Power's Millbank gas turbine generating site, and a third operated by the Weyerhaeuser Company.

Pollutants of concern in these networks include hydrogen sulphide and particulates (UPM) plus nitrogen dioxide and sulphur dioxide (Millbank).

Figure 4 shows the locations of the sites in the region.

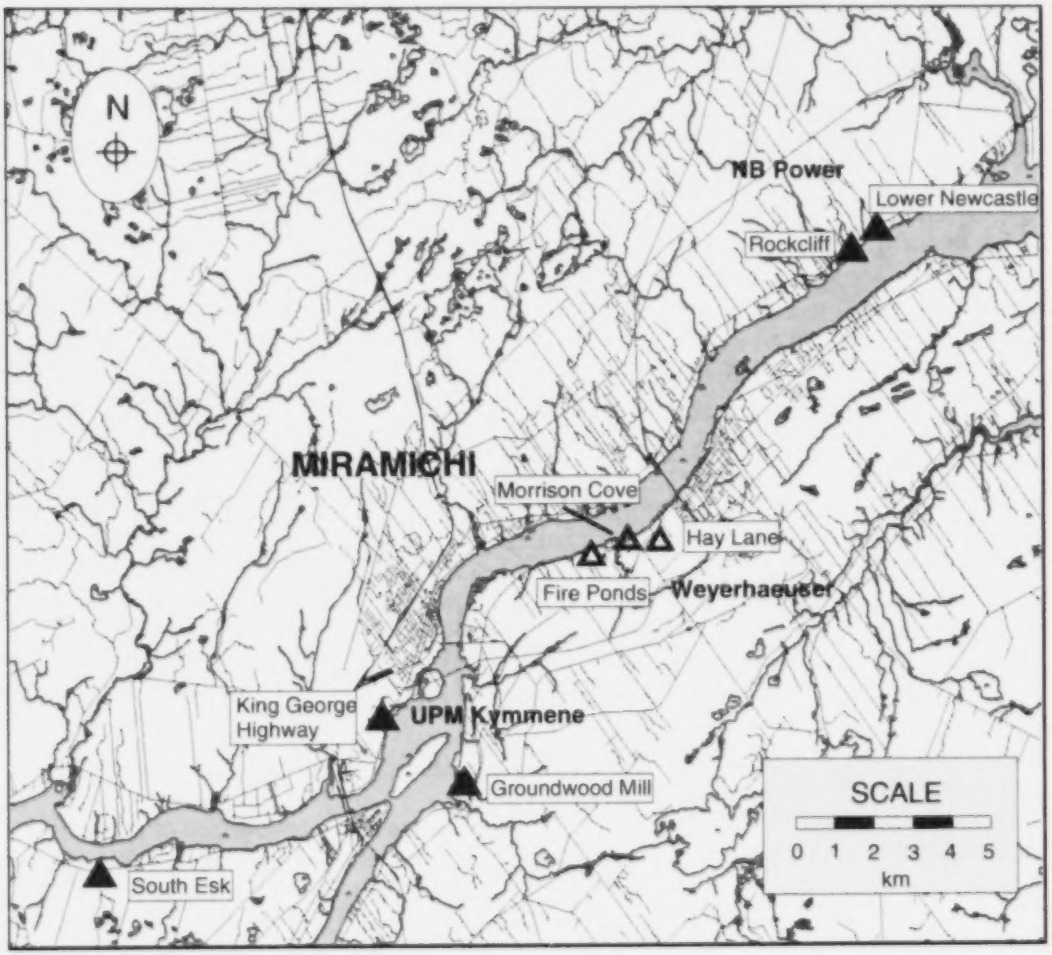


Figure 4. Air quality monitoring sites in the Miramichi Region.

B.1 UPM NETWORK

B.1.1 Total Reduced Sulphur

The compliance summary for 2005 is contained in the following table, which also shows results for each year since 1996.

Exceedances of provincial objectives for TRS, Miramichi, 1996-2005			
		GROUNDWOOD	KING GEORGE HWY
2005	1-h	4	3
2004	1-h	0	142
2003	1-h	2	56
2002	1-h	0	23
2001	1-h	1	90
2000	1-h	0	598
1999	1-h	5	488
1998	1-h	9	410
1997	1-h	3	429
1996	1-h	19	569
2005	24-h	0	61
2004	24-h	74	1149
2003	24-h	5	491
2002	24-h	0	232
2001	24-h	4	772
2000	24-h	0	2219
1999	24-h	9	2497
1998	24-h	25	1636
1997	24-h	0	2105
1996	24-h	20	2243

Note: for evaluation of TRS data, and in the absence of a specific objective for TRS, reference is made to the provincial objectives for hydrogen sulphide.

There was a large decrease in the number of exceedances at the King George Highway site, as expected following the shut down of the kraft pulp mill in 2004. Occasional elevated TRS levels at both King George Highway are thought to be due to maintenance work at the coated paper facility. The four exceedances at the Groundwood site appear to be due to TRS released from tidal flats during periods of low tide.

B.1.2 Total Suspended Particulate

There were no exceedances of the TSP standard at any of the three stations in the network during 2005. Results since 1996 are shown in the table on the following page. Detailed results are shown in Appendix I.

Exceedances of standards for TSP, Miramichi network, 1996-2005				
		Groundwood	King George Hwy	South Esk
2005	24-h	0	0	0
2004	24-h	0	0	0
2003	24-h	0	0	0
2002	24-h	0	2	0
2001	24-h	0	0	0
2000	24-h	0	0	0
1999	24-h	0	0	0
1998	24-h	0	0	0
1997	24-h	0	0	0
1996	24-h	0	0	0

B.2 MILLBANK NETWORK

The two sites at Millbank (Rockcliff and Lower Newcastle, see Figure 4) are positioned to assess the impact of NB Power's gas turbine generating station. The pollutants monitored include sulphur dioxide, nitrogen dioxide and TSP (Rockcliff only). Since 1996 there have been no exceedances for SO_2, NO_2 or TSP logged in this network.

B.2.1 Nitrogen dioxide

There were no exceedances of the 1-hour or 24-hour objective at either monitoring site in 2005, and monthly means were all very low. Monthly results for 2005 are shown in Appendix I.

B.2.2 Sulphur dioxide

There were no exceedances of the 1-hour or 24-hour objective at either site in the network. The monthly means were also very low. Monthly results are shown in Appendix I.

B.2.3 Total Suspended Particulate

None of the measurements made at the Rockcliff site exceeded the 24-hour objective of 120 micrograms per cubic metre in 2005, and almost all were well below this value. Detailed results are given in Appendix I.

B.3 WEYERHAEUSER

B.3.1 Total Suspended Particulate

Weyerhaeuser operates a manufacturing plant for oriented strand board, located on the south shore of the Miramichi River. Two sites are maintained by this company for TSP, one at Morrison Cove and one at the Fire Ponds site. The sampling schedule in 2005 was every sixth day.

During 2005, there was one exceedance of the 24-h standard of 120 micrograms per cubic metre, at the Fire Ponds site in June. The annual objective of 70 micrograms per cubic metre was not exceeded at either site. Data are summarised in detail in Appendix I.

Exceedances of provincial objectives for TSP, Weyerhaeuser, Miramichi, 2000-2005				
		Mirview Subdiv	Morrison Cove	Fire Ponds
2005	24-h		0	1
2004	24-h		0	0
2003	24-h	closed	1	2
2002	24-h	1	0	
2001	24-h	0	1	
2000	24-h	0	1	

B.3.2 PM2.5

Fine particulate (PM2.5) was measured continuously at two sites: Fire Ponds and Hay Lane (see Figure 4). Monitors at these sites use the beta attenuation (BAM) method. Results are summarised in the table below.

PM2.5 Results for 2005, Weyerhaeuser Network, Miramichi		
	Fire Ponds	**Hay Lane**
Annual average (micrograms per cubic metre)	8.9	5.7
98th percentile value (Canada wide standard statistic)	22.8	18.2
Days with 24-h average >30 micrograms/cubic metre	2	0
Hours with running 24-h average >30	38	15

C. GRAND LAKE - NB POWER

Figure 5 shows the locations of the four monitoring sites in this network. These are sited to monitor the effects of the Grand Lake coal-fired electrical generating station and associated activities. The four monitoring sites are operated by NB Power and each measures sulphur dioxide and TSP.

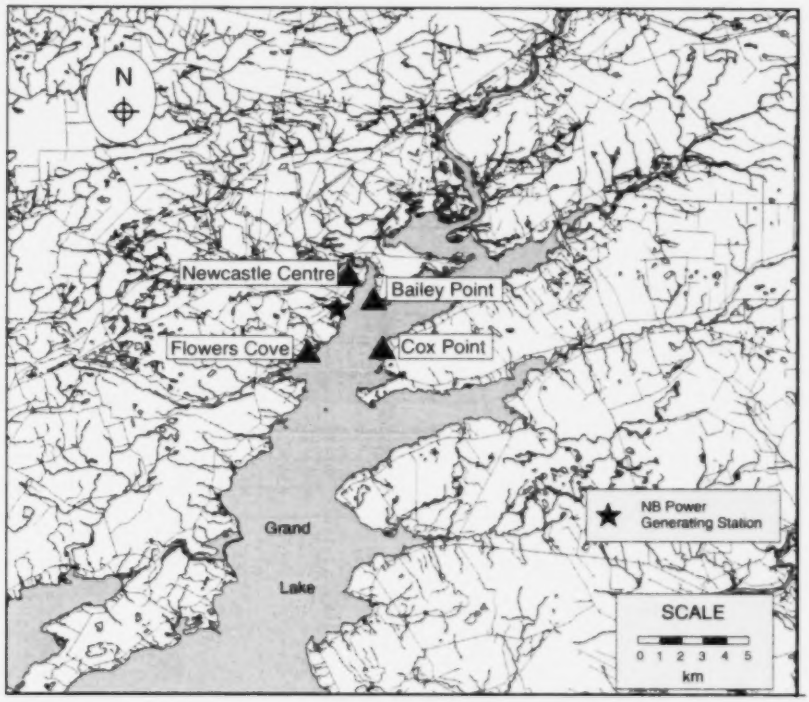


Figure 5. Air quality monitoring sites in the Grand Lake Network.

C.1 Sulphur dioxide

In 2005 there was one exceedance of the 1-h standard of 340 parts per billion, at Newcastle Centre. The 24-h standard of 113 ppb was not exceeded at any site. Compliance statistics for SO_2 since 1996 are shown in the table on the following page.

C.2 Total Suspended Particulate

In 2005, there were no exceedances of the 24-hour standard of 120 micrograms per cubic metre in this network. Complete results are given in Appendix I. Compliance statistics for TSP since 1996 are shown in the table on the following page.

Exceedances of provincial objectives for SO_2, NB Power Grand Lake Network, 1996-2005					
		BAILEY PT	COX PT	FLOWERS COVE	NEWCASTLE CENTRE
2005	1-h	0	0	0	1
2004	1-h	1	0	1	6
2003	1-h	1	0	2	5
2002	1-h	0	0	3	3
2001	1-h	0	2	0	0
2000	1-h	0	0	0	2
1999	1-h	0	0	0	4
1998	1-h	0	1	0	5
1997	1-h	0	0	2	3
1996	1-h	1	1	0	5
2005	24-h	0	0	0	0
2004	24-h	0	0	0	0
2003	24-h	0	0	0	0
2002	24-h	0	0	0	0
2001	24-h	0	0	0	0
2000	24-h	0	0	0	0
1999	24-h	0	0	0	0
1998	24-h	0	0	0	0
1997	24-h	0	0	0	0
1996	24-h	0	0	0	0

Exceedances of provincial objectives for TSP, NB Power Grand Lake Network, 1996-2005					
		BAILEY PT	COX PT	FLOWERS COVE	NEWCASTLE CENTRE
2005	24-h	0	0	0	0
2004	24-h	0	0	0	0
2003	24-h	0	0	0	0
2002	24-h	0	0	0	0
2001	24-h	0	0	0	0
2000	24-h	0	0	0	0
1999	24-h	0	0	1	0
1998	24-h	0	0	0	0
1997	24-h	0	0	0	0
1996	24-h	0	0	0	0

D. EDMUNDSTON – FRASER INC.

Figure 6 shows the locations of the monitoring sites, located primarily to monitor the impacts of the Fraser Inc. pulp mill.

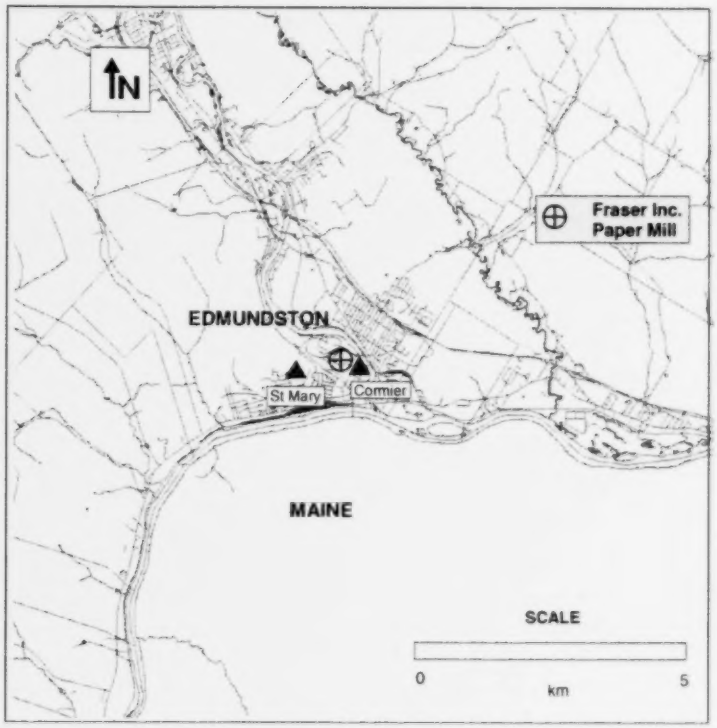


Figure 6. Air quality monitoring sites in Edmundston.

D.1 Sulphur Dioxide

There were no exceedances of SO_2 objectives in this network during 2005. Compliance statistics for SO_2 since 1996 are shown in the table on the following page.

D.2 $PM_{2.5}$ Particulate Matter

Continuous fine particulate measurements (TEOM) began at the Cormier site in June 2000.

In 2005, there was one day having a 24-hour average exceeding the Canada-wide Standard of 30 micrograms per cubic metre, June 4. Statistics are shown in the table on the following page, and additional results are shown in Appendix I.

Exceedances of provincial objectives for SO_2, Fraser Edmundston Network, 1996-2005				
		CORMIER SCHOOL	SACRED HEART SCHOOL	ST MARY
2005	1-h	0		0
2004	1-h	0		0
2003	1-h	0		0
2002	1-h	0		0
2001	1-h	0		
2000	1-h	2	0	
1999	1-h	2	0	
1998	1-h	0	0	
1997	1-h	0	0	
1996	1-h	0	0	
2005	24-h	0		0
2004	24-h	0		0
2003	24-h	0		0
2002	24-h	40		0
2001	24-h	0		
2000	24-h	0	0	
1999	24-h	0	0	
1998	24-h	0	0	
1997	24-h	0	0	
1996	24-h	0	0	

PM 2.5 Results for 2005, Fraser - Edmundston	
	Cormier
Annual average (micrograms per cubic metre)	7.0
98th percentile value (Canada wide standard statistic)	23.2
Days with 24-h average >30 micrograms/cubic metre	1
Hours with running 24-h average >30	34

Exceedances of provincial objectives for TSP, Fraser Edmundston Network, 1996-2001			
Year	Objective	Cormier School	Sacred Heart School
2001	24-h	closed	closed
2000	24-h	6	2
1999	24-h	9	1
1998	24-h	14	0
1997	24-h	11	1
1996	24-h	12	1

E. BELLEDUNE

There are a number of monitoring sites in the Belledune region. Four of these are located for the assessment of emissions from the Noranda Inc Brunswick Smelter complex. A further five monitors are operated for the assessment of NB Power's coal-fired electrical generating station.

Figure 7 shows the locations of all the monitoring sites in the region.

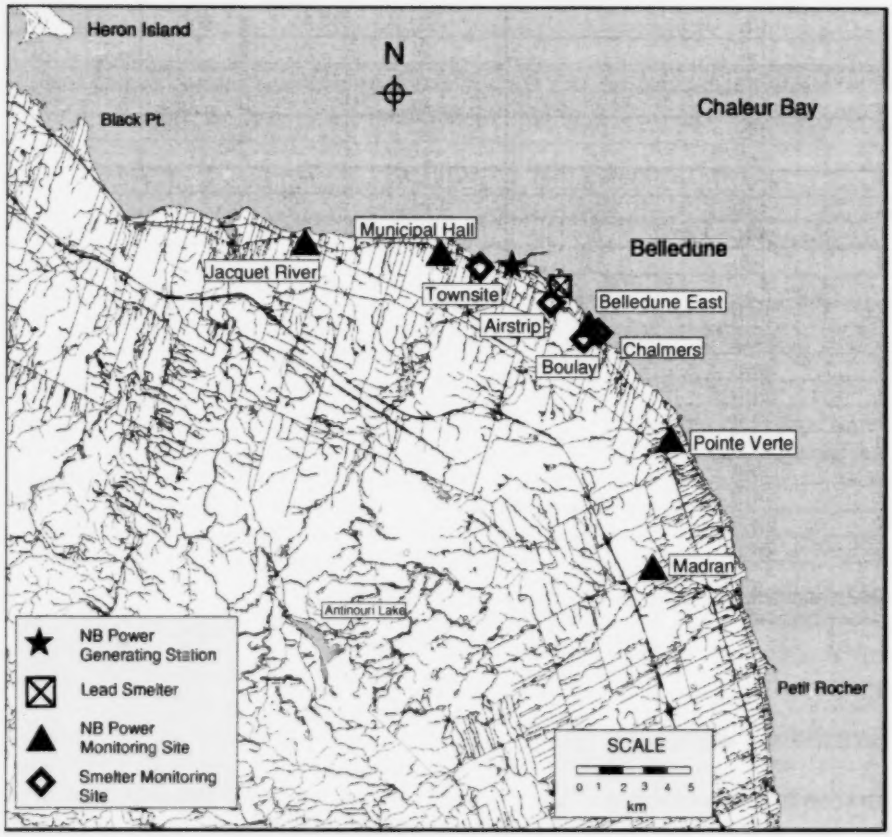


Figure 7. Air quality monitoring sites in the Belledune Network.

E.1 NORANDA INC., BRUNSWICK SMELTER

All sites in the Noranda Inc network monitor sulphur dioxide, and three also measure TSP.

E.1.1 Sulphur dioxide

In 2005 there was one exceedance of the 1-h objective at each of the Chalmers and Townsite locations. Compliance statistics for SO_2 since 1996 are shown in the following table.

Exceedances of provincial objectives for SO_2, Brunswick Mining and Smelting Network, 1996-2005

Year	Objective	AIRSTRIP	BOULAY	CHALMERS	TOWNSITE
2005	1-h		0	1	1
2004	1-h		0	0	0
2003	1-h				
2002	1-h	4	1	3	0
2001	1-h	26	4	2	0
2000	1-h	4	2	1	1
1999	1-h	10	1	1	1
1998	1-h	4	4	7	2
1997	1-h	2	1	0	3
1996	1-h	14	0	9	40
2005	24-h		0	0	0
2004	24-h		0	0	0
2003	24-h				
2002	24-h	0	0	0	0
2001	24-h	0	0	0	0
2000	24-h	0	0	0	0
1999	24-h	29	0	0	0
1998	24-h	12	0	0	0
1997	24-h	0	0	0	0
1996	24-h	45	0	0	58

Note: In 2003, data were available only for the period January-June.

E.1.2 Total Suspended Particulate

In 2005 there were no exceedances. Compliance statistics for TSP since 1996 are shown in the following table.

Exceedances of provincial objectives for TSP, Brunswick Mining and Smelting Network, 1996-2005

Year	Objective	AIRSTRIP	BOULAY	CHALMERS	TOWNSITE
2005	24-h		0	0	0
2004	24-h		0	0	0
2003	24-h				
2002	24-h	0		0	0
2001	24-h	0		0	0
2000	24-h	1		0	1
1999	24-h	1		0	0
1998	24-h	0		0	0
1997	24-h	0		0	0
1996	24-h	0		0	1

E. 2 NB POWER

There are five sites in this network, all of which monitor for sulphur dioxide. Two sites also monitor nitrogen dioxide.

E.2.1 Sulphur dioxide

During 2005 there were three exceedances at the Jacquet River site. Compliance statistics for SO_2 since 1996 are shown in the following table.

E.2.2 Nitrogen dioxide

This contaminant is measured at Belledune East and Municipal Hall. There were no exceedances of the applicable 1 or 24-hour objectives in 2005 at either location. There have been no exceedances of NO_2 recorded in this network since 1996.

Exceedances of provincial objectives for SO_2, NB Power Belledune Network, 1996-2005

Year	Objective	BELLEDUNE EAST	JACQUET RIVER	MADRAN	MUNICIPAL HALL	POINTE VERTE
2005	1-h	0	3	0	0	0
2004	1-h	0	0	0	0	0
2003	1-h	3	0	0	1	0
2002	1-h	4	0	0	0	1
2001	1-h	2	0	0	1	0
2000	1-h	2	0	0	1	0
1999	1-h	1	0	0	0	0
1998	1-h	4	0	0	0	0
1997	1-h	1	0	0	0	0
1996	1-h	2	0	0	5	0
2005	24-h	0	0	0	0	0
2004	24-h	0	0	0	0	0
2003	24-h	0	0	0	0	0
2002	24-h	0	0	0	0	0
2001	24-h	0	0	0	0	0
2000	24-h	0	0	0	0	0
1999	24-h	0	0	0	0	0
1998	24-h	0	0	0	0	0
1997	24-h	0	0	0	0	0
1996	24-h	0	0	0	1	0

F. DALHOUSIE – NB Power

Figure 8 shows the locations of the sites in the region. The sites in this region are operated to monitor the effects of the NB Power Dalhousie electrical generating station. Six sites measure sulphur dioxide. One of the six also monitors for TSP, and there is one additional TSP site (7 sites in all). Because of potential pollution transport across the Bay of Chaleur, one of the stations is located in the province of Québec.

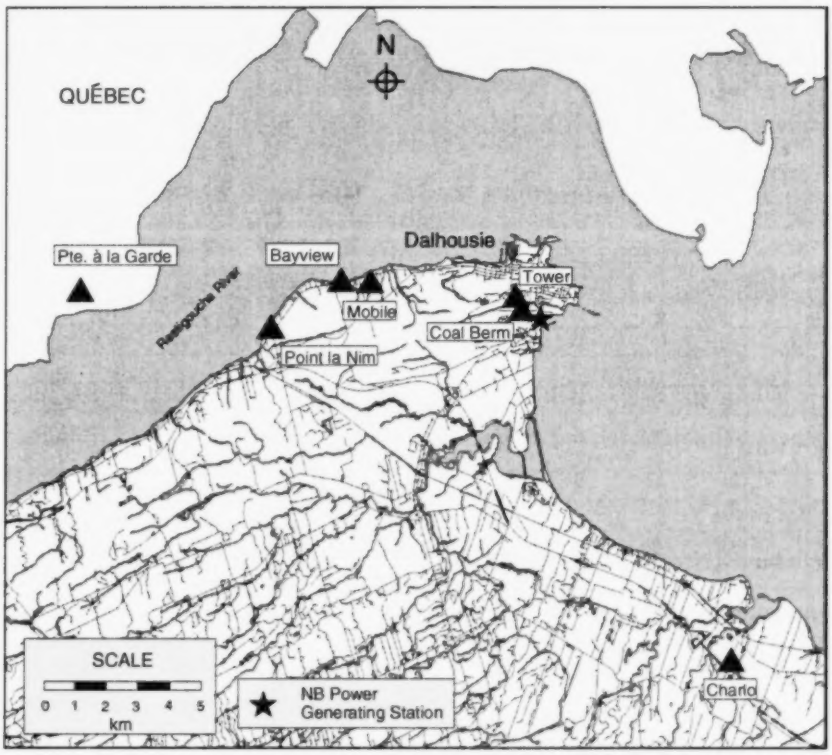


Figure 8. Air quality monitoring sites in the Dalhousie Network.

F.1 Sulphur dioxide

Compliance with the applicable 1-hour, 24-hour and annual objectives was 100% at all sites in 2005. Detailed summaries are given in Appendix I. There have been no exceedances of SO_2 recorded in this network since 1996.

F.2 Total Suspended Particulate

TSP was measured at the Coal Berm and Dalhousie Tower sites. Results are shown in Appendix I. None of the individual readings obtained was above the 24-hour objective of 120 micrograms per cubic metre in 2005, and the annual geometric means were also below 10 micrograms per cubic metre (the standard is 70 micrograms per cubic metre). There have been no exceedances of TSP recorded in this network since 1996.

G. ATHOLVILLE - AV CELL INC.

G.1 Sulphur dioxide

AV Cell Inc. operates a pulp mill in Atholville, and maintains two associated ambient air monitoring sites, Boom Road (to the west of the mill) and Beauvista (east). Sulphur dioxide is measured at both sites.

Compliance during 2005 was 100% with no exceedances of the 1-hour objective (340 ppb), 24-h objective (113 ppb) or the annual objective (23 ppb) at either site. Compliance statistics for SO_2 since 1999 (when the network was established) are shown in the following table.

Exceedances of provincial objectives for SO_2, AV Cell Network, 1999-2005

Year	Objective	BOOM RD (W)	BEAUVISTA (E)
2005	1-h	0	0
2004	1-h	0	0
2003	1-h	0	0
2002	1-h	0	0
2001	1-h	0	0
2000	1-h	1	0
1999	1-h	0	3
2005	24-h	0	0
2004	24-h	0	0
2003	24-h	0	0
2002	24-h	0	0
2001	24-h	0	0
2000	24-h	0	0
1999	24-h	0	0

H. BATHURST

H.1 $PM_{2.5}$

2005 was the first full year of operation for the site at Rough Waters Drive. Concentrations were higher in the first few months than the remainder of the year. Results are summarised in the table below.

PM 2.5 Results for 2005, Bathurst

	Rough Waters Drive (TEOM)
Annual average (micrograms per cubic metre)	4.6
98th percentile value (Canada wide standard statistic)	18.2
Days with 24-h average >30 micrograms/cubic metre	0
Hours with running 24-h average >30	3

I. FREDERICTON

The Fredericton site is on Aberdeen Street, in an area representative of the "downtown" residential and business district. The site is also considered representative of a wider area for pollutants, such as ozone, which are regional in nature.

I.1 Carbon monoxide

No exceedances of the 1-hour or 8-hour objectives (respectively 30 ppm and 13 ppm) were recorded. Peak values were higher in the fall and winter months than during the summer, but even then, peak hourly readings were only about 10% of the standard. There have been no exceedances of CO at this site since it was established in 1999.

I.2 Nitrogen dioxide

No exceedances of the 1 or 24-hour objectives (210 ppb and 105 ppb) were recorded. As for carbon monoxide, higher readings were seen in the cooler months, but levels remained low. There have been no exceedances of NO_2 at this site since it was established in 1999.

I.3 Ground level ozone

There were no exceedances during 2005 of the national 1-hour objective for ozone. There were also no hours in exceedance of the Canada-wide Standard of 65 ppb (8-h average). There is additional discussion of data from the ozone network in section 4.

I.4 $PM_{2.5}$ Particulate matter

Fine particulate matter ($PM_{2.5}$) was measured at the Aberdeen Street site using a TEOM instrument, which provides a continuous record of particulate concentrations. Data obtained during 2005 indicated generally moderate to low particulate concentrations. Data are summarised in the table below.

I.5. Index of the Quality of the Air

Results for 2005 showed air quality in the "good" category for 99.3% of the time, with 0.7% in the "fair" range. Ozone was responsible for the small number of hours in the fair range. Results were made available hourly via recorded voice message at 451 6000.

PM 2.5 Results for 2005, Fredericton	
	Aberdeen St (TEOM)
Annual average (micrograms per cubic metre)	4.3
98th percentile value (Canada wide standard statistic)	16.0
Days with 24-h average >30 micrograms/cubic metre	0
Hours with running 24-h average >30	6

J. NACKAWIC

Sulphur dioxide, total reduced sulphur (TRS) and total suspended particulate (TSP) are measured at the Caverhill Road site, as well as wind speed and direction. During 2005 the mill was not in operation and no data were recorded.

The compliance history for TRS since 1999 is shown in the accompanying table. As for SO_2, no TSP exceedances have been recorded at this site.

Exceedances of provincial objectives for TRS, Nackawic Network, 1999-2005

Year	Objective	Caverhill Road
2005	1-h	M
2004	1-h	6
2003	1-h	1
2002	1-h	6
2001	1-h	0
2000	1-h	6
1999	1-h	4
2005	24-h	M
2004	24-h	19
2003	24-h	0
2002	24-h	0
2001	24-h	0
2000	24-h	0
1999	24-h	33

Note: results for 2004 based on 8 months of operation. The Nackawic mill was shut down in August 2004 and remained closed at the end of the year. M= missing data.

K. MONCTON

The Moncton air quality monitoring site is situated at the Highfield Street water pumping station. The site location was chosen to provide readings representative of the central city suburbs, which may be influenced by emissions from vehicles or institutional heating systems, as well as regional pollutants such as ozone.

K.1 Carbon monoxide

No exceedances of hourly or 8-hourly objectives for carbon monoxide occurred during 2005. Readings were similar to those recorded in downtown Saint John and Fredericton, remaining well below objectives. No exceedances of CO objectives have been recorded since monitoring began in 1998.

K.2 Nitrogen dioxide

No exceedances of hourly or 24-hourly standards for nitrogen dioxide were recorded during 2005. Maximum hourly values were less than 25% of the objective. No exceedances of NO_2 objectives have been recorded since monitoring began in 1998.

K.3 Ozone

There were no exceedances of the hourly objective for ozone (82 ppb). More discussion of ozone data may be found in section 4.

K.4 $PM_{2.5}$ Particulate matter

The 2005 results revealed a few hourly values over 40 micrograms per cubic metre ($\mu g/m^3$). Data are summarized in the table below.

PM 2.5 Results for 2005, Moncton (TEOM)

	Highfield St
Annual average (micrograms per cubic metre)	3.6
98th percentile value (Canada wide standard statistic)	16.2
Days with 24-h average >30 micrograms/cubic metre	0
Hours with running 24-h average >30	11

K.5 Index of the Quality of the Air

Hourly IQUA reports are generated for the Moncton site and made available via recorded message at 851 6610. Summary statistics for 2005 indicated that good air quality was recorded for 99.0% of all hours, and fair for 1.0%.

L. ST. ANDREWS

The St. Andrews monitoring station is located on the grounds of the Huntsman Marine Science Centre (H.M.S.C.) and is operated with the support of staff from the Centre and DENV. This site has been used for a variety of special sampling projects and is especially suitable for investigating trans-boundary air pollution. Currently, projects operated at St. Andrews by the province include ozone and $PM_{2.5}$ monitoring. Additionally, mercury concentrations in air are monitored at this site, in collaboration with Environment Canada. This is the only location in the province where these mercury measurements are made, and one of only two locations in the Maritimes.

L.1 $PM_{2.5}$ (TEOM)

In general, readings were very low at this site. Data are summarized in the following table.

L.2 Mercury monitoring

Mercury is of concern as an environmental contaminant because of its ability to accumulate in living organisms, potentially reaching concentrations which could pose a hazard to health in humans and wildlife (e.g. NESCAUM, 1998). Although mercury has been recognised as an environmental pollutant for decades, relatively little monitoring and assessment of the transport and behaviour of mercury in the atmosphere has taken place. Most attention has been paid to direct discharges, for example of industrial, water-borne effluents. In 1998, the New England Governors and Eastern Canadian Premiers identified mercury as a substance of concern in the east of Canada and the United States, and developed an Action Plan to improve our understanding of its impacts, and also proposed measures to reduce man-made emissions (NEGECP, 1998).

Mercury monitoring conducted at St. Andrews contributes to the scientific understanding of mercury in the environment. The results are used in research (for example, into atmospheric processes) as well as in wildlife and other studies.

The table on the following page summarises results of the mercury monitoring program so far. These monitoring studies are operated cooperatively between Environment Canada, the Huntsman Marine Science Centre, and DENV.

PM 2.5 Results for 2005, St Andrews (TEOM)	
	H.M.S.C.
Annual average (micrograms per cubic metre)	2.7
98th percentile value (Canada wide standard statistic)	10.3
Days with 24-h average >30 micrograms/cubic metre	0
Hours with running 24-h average >30	0

Mercury Monitoring Results 1995-2005			
Ambient Air			
St Andrews		Other sites	
Year	Annual Average (ng/cubic metre)	Site	Annual averages (ng/cubic metre)
1995	1.9	Mt Mansfield, VT	2.0 (94-96)
1996	1.5	Kejimkujik, NS	1.5 (2004)[1]
1997	1.4	Westfield, NY	2.6 (94-96)
1998	1.4	Moss Lake, NY	2.4 (94-96)
1999	1.6		
2000	1.4		
2001	1.4		
2002	(1.2)[2]		
2003	1.5*		
2004	1.3		
2005	Unavailable		
Precipitation (rain and snow)			
Year	Mean mercury concentration (ng/L)	Kejimkujik, N.S.	Mean mercury concentration (ng/L)
1996	7.5	1996	7.4
1997	6.7	1997	5.9
1998	5.8	1998	5.2
1999	6.5	1999	5.0
2000	6.5	2000	4.7
2001	6.3	2001	5.4
2002	4.6	2002	5.2
2003	5.2	2003	4.6
2004	closed	2004	4.9
		2005	4.4
Notes: ng = nanograms. 1 nanogram is one thousand-millionth of a gram. Ambient air mercury data supplied by Environment Canada. [2] Note: in 2002, sampler operated only January-July. * In 2003, sampler operated May-December		References: NESCAUM (1998) NADP (2000) [1] Environment Canada.	

There are no environmental guidelines or objectives for mercury in air or precipitation at present. The data may be used to look for patterns or trends over time, and to compare regionally with other locations. They are also used as input to ecological models which attempt to track how mercury moves though different components of the environment.
The results show several things. In ambient air, the concentration of mercury in vapour form typically varies between approximately 1.5 and 2 nanograms per cubic metre as an annual average. These values are similar to those measured in Nova Scotia and rural southern Quebec, and lower than readings obtained at sites in parts of New England or southern Ontario, where they typically range from 2 to 3 nanograms per cubic metre (NESCAUM, 1998).

Over the course of a year, readings at St. Andrews tend to be highest in late winter and lowest in late summer. The reasons for this have not yet been fully explored, but the changing use of fossil fuels through the year is thought to be a major influence (NESCAUM, 1998). The 2005 results showed slightly lower air concentrations of mercury than previous years.

4. RURAL OZONE NETWORK

Figure 9 shows the locations of the sites which monitor ground level ozone in New Brunswick. This network is operated to assess the impact of long-range transported ozone. It focuses on the southern portion of the province, which is the region most affected by long range transport, as shown by special short-term monitoring studies and trajectory analyses (e.g. Fuentes and Dann, 1994; Tordon et al., 1994; Multistakeholder NOx/VOC Science Program, 1997a, 1997b). Two sites in the northern part of the province were added to the network in 2000, St. Leonard in the northwest, and Lower Newcastle in the northeast. Ground-level ozone readings in 2005 were similar to those in 2004. The 1-h objective of 82 ppb was exceeded at three stations. All these exceedances occurred during two episodes in June. The number of hours of exceedance is quite variable from year to year, being heavily influenced by the weather. Results are summarised in the following table. Monthly means and extremes are shown in Appendix I.

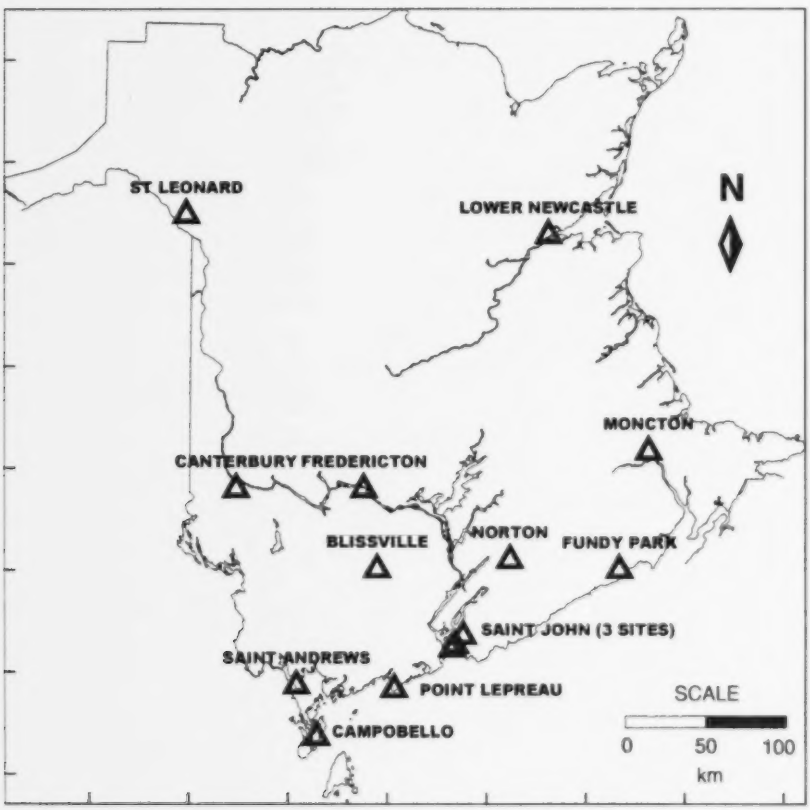


Figure 9. Locations of ozone monitoring sites in New Brunswick (2005).

Exceedances of the 1-hour ozone objective, 2005 (number of hours)													
Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Blissville													0
Campobello Isl.													0
Canterbury													0
Customs						4							4
Forest Hills													0
Fredericton													0
Fundy Park						1							1
Hillcrest													0
Lower Newcastle													0
Mobile (Lamèque)	-	-	-	-	-						-	-	0
Moncton													0
Norton													0
Pt. Lepreau						1							1
St. Andrews													0
St Leonard													0
Total	0	0	0	0	0	6	0	0	0	0	0	0	6

The 1- hour National Objective is 82 ppb. The Campobello site is operated in summer only. M = missing data.

A. Smog Advisories

DENV works with Environment Canada and the Department of Health and Wellness in the preparation and dissemination of daily forecasts of ozone. DENV maintains the monitoring network and supplies real-time data to Environment Canada forecasters, who issue twice-daily forecasts of ozone concentrations. When forecast data indicate that the 1-hour National Air Quality Objective for ozone will be exceeded or closely approached, air quality and health advisories are issued to the media to provide advance notice to the public. Advisories may be issued for specific regions of the province.

In 2005, there was one advisory issued at 4.57 a.m. on June 25th, covering southern and southwestern districts. Hourly exceedances were noted at the Customs site in the early hours of June 26, at Point Lepreau on the 25th. A separate episode on June 10 exceeded the 1-h objective for one hour at Fundy Park. There was no smog advisory issued on that date.

5. CANADA-WIDE STANDARDS

A. Canada-wide Standard for Ozone

Figures 10 and 11 show Canada-wide standard (CWS) values for 2005 and the previous six or seven years. Each plotted point is calculated as the average of three years ending at that time, i.e. the point for 2004 is the average for the years 2002-2004. The CWS is 65 ppb. Figure 10 shows results for urban stations and results for rural sites are shown in Figure 11. In general, values are lower in urban locations. Most results are below the CWS criterion. The 3-year average CWS changed little in 2004-5 at most sites.

The data for compliance with the ozone and PM2.5 Canada-wide standards is 2010.

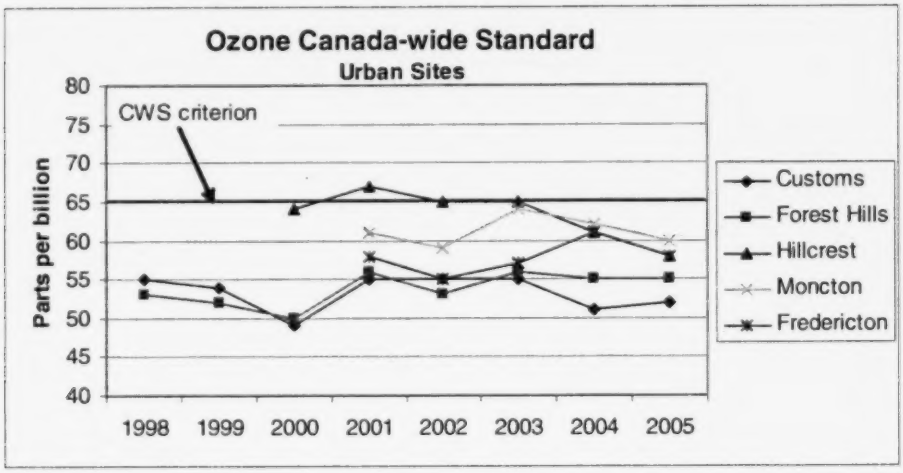


Figure 10. Canada-wide standard results for ozone at urban sites,1998-2005.

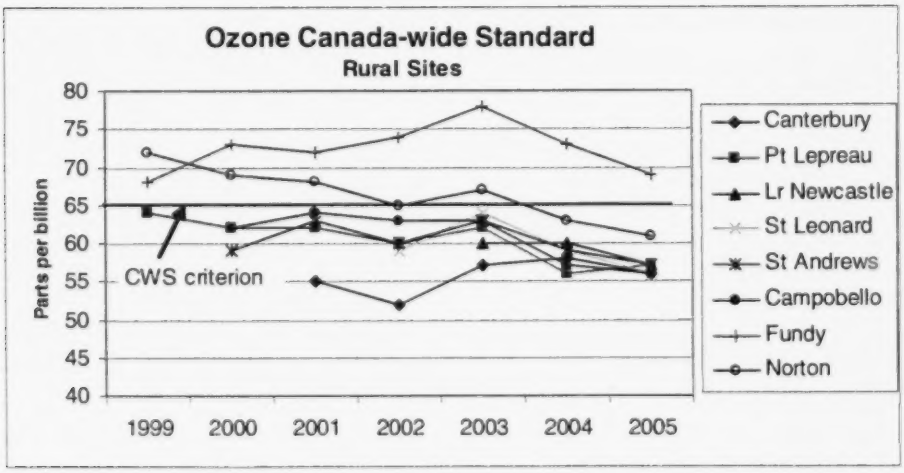


Figure 11. Canada-wide standard results for ozone at rural sites,1998-2005.

B. Canada-wide standard for $PM_{2.5}$

Figures 12 and 13 show CWS results for PM2.5. Figure 12 shows results for sites in central and northern New Brunswick and Figure 13 shows results for stations in Saint John. The CWS is 30 micrograms per cubic metre. As for the ozone CWS charts, each plotted point is a three-year average. The period of record varies between sites. Results at all stations have remained below the CWS standard to date, and have fallen since 2002-3. Years where all stations show higher values are usually caused by forest fire smoke events, that often affect wide areas of the province at the same time.

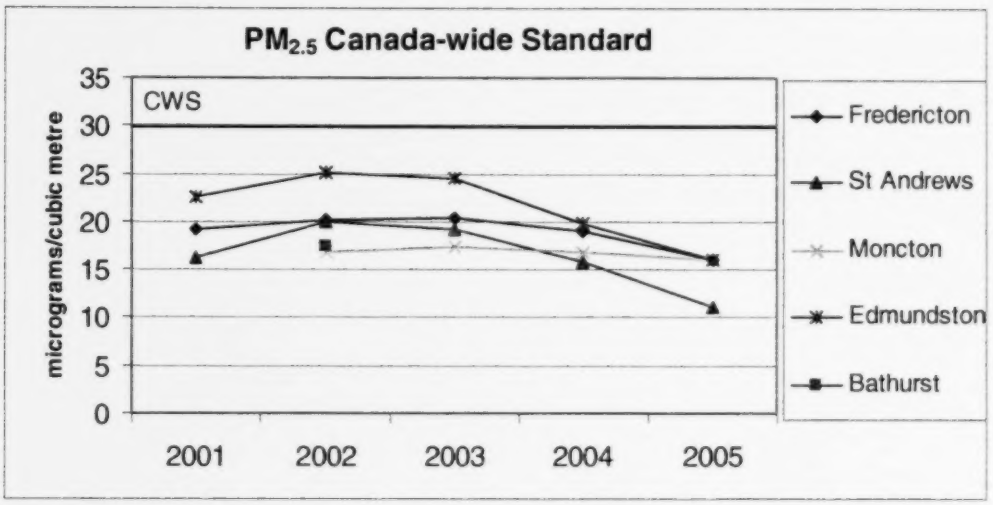


Figure 12. Canada-wide standard results for PM2.5, 2001-2005.

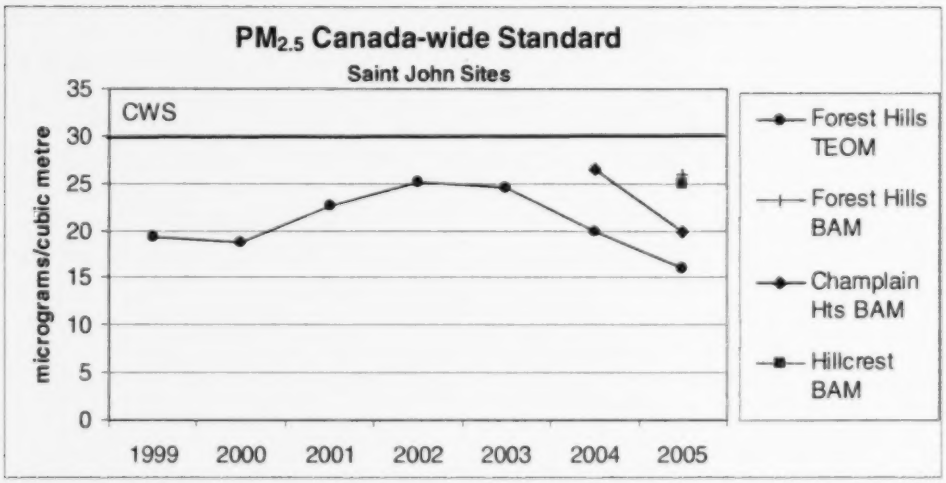


Figure 13. Canada-wide standard results for PM2.5 at Saint John sites, 1999-2005.

Note: results for Champlain Heights and Hillcrest are for one year only. For notes on the TEOM and BAM technologies, see page 6.

6. ACID PRECIPITATION NETWORK

Figure 14 shows the location of monitoring sites, and acid deposition for the period 1995-2005 is shown in a table (next page). Acid deposition values in 2005 were higher at almost all stations than in 2004, due to an increase in precipitation. The greatest acid deposition and the highest annual average sulphate concentration were both recorded at the Pennfield station.

In 2005, total annual precipitation was above normal almost everywhere, with a surplus of 40% in the northwest.

New Brunswick has operated an extensive precipitation chemistry network since the early 1980s. Since 1987 this has been a partnership effort, with logistical and financial support from NB Power. In 2005 there were 13 stations operating and they are predominantly located in rural areas. All precipitation samples are analysed at the DENV laboratory, and DENV staff co-ordinate the monitoring program, perform data quality assurance, and maintain the official data archive.

The potentially adverse impacts of acid precipitation have been recognised for more than 20 years. Acid rain effects are felt regionally, not just close to the sources of contaminants themselves. The emissions which cause acid precipitation (primarily sulphur and nitrogen oxides) typically travel long distances - hundreds or even thousands of

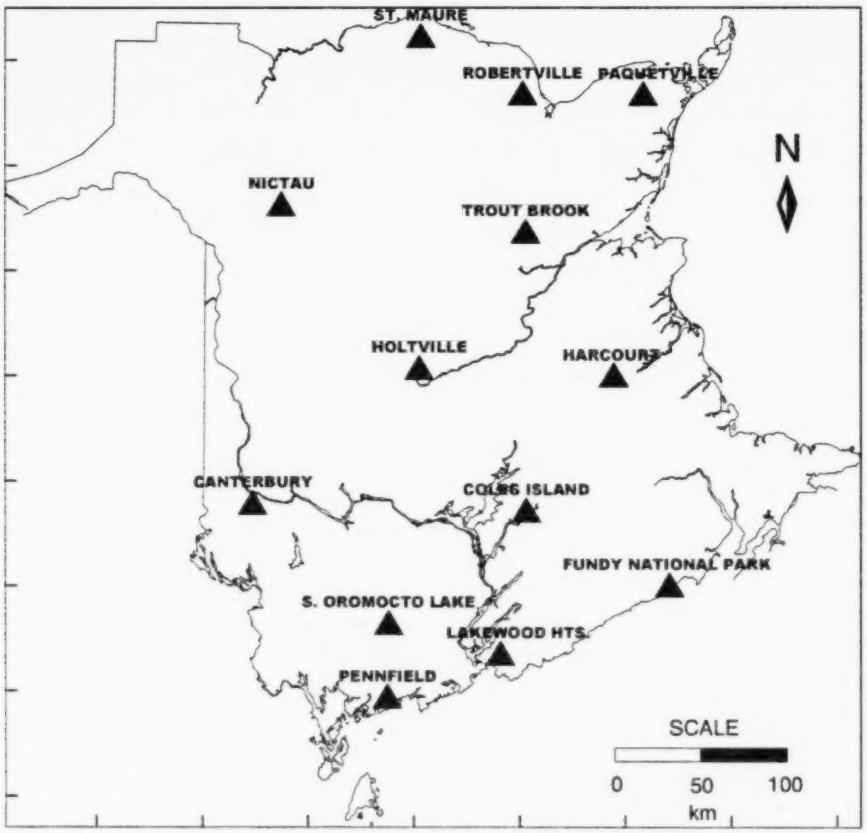


Figure 14. Location of acid rain monitoring sites in New Brunswick (2005).

Acid Deposition (kg/ha/yr) at New Brunswick Monitoring Sites, 1995-2005											
Site	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
St. Maure	8.79	9.98	8.16	14.42	11.18	9.73	7.14	8.08	8.53	7.77	10.63
Robertville	8.77	8.75	8.42	13.53	10.61	9.48	7.98	10.08	7.25	7.48	11.36
Petit Paquetville	7.95	7.32	9.80	10.83	9.36	8.89	8.33	7.64	7.24	7.11	10.07
Nictau	7.59	8.98	8.56	15.04	11.19	0.86%	9.367	9.59	7.08	8.00	9.31
Trout Brook	7.25	7.91	11.82	11.26	8.44	8.36	9.89	9.12	9.04	6.42	10.74
Holtville	7.74	13.75	10.25	14.42	9.79	11.48	8.94	10.58	10.75	8.29	12.01
Harcourt	7.81	10.69	9.89	12.53	9.05	9.82	7.50	10.00	9.81	7.27	9.50
Canterbury	9.29	10.39	10.54	8.93	9.8	10.49	8.46	10.47	9.58	7.32	13.35
Fundy	15.03	16.56	17.04	18.28	13.99	19.04	10.62	15.07	13.23	12.66	15.43
South Oromocto Lake	10.00	12.47	12.69	16.86	11.52	13.17	9.60	10.95	11.14	5.80*	2.97&
Lakewood Heights	13.28	14.98	17.21	18.29	13.27	16.36	10.17	14.94	16.89	12.83	13.01$
Pennfield	12.88	13.65	13.88	17.89	13.93	14.20@	10.49	13.30	12.03	12.12	16.45
Coles Island	0.72#	9.75	16.4	13.32	9.35	12.28	7.44	10.84	10.62	8.28	9.20

8 weeks only. % 6 weeks only. @ 41 weeks only. * 27 weeks only. $ 48 weeks only. & 11 weeks only.

kilometres - before returning to the surface in rain or snow. The same emissions also contribute to regional haze and fine particulate pollution.

Precipitation chemistry in New Brunswick is affected by local emissions and the emissions from several large industrial regions which lie upwind, including the American midwest, southern Ontario and Québec, and the Washington-Boston region. Partly because the site of impact can be remote from the point of emission, no standards have been put in place for acid precipitation, although the province does have an ambient air standard for SO_2 along with a provincial emission cap for SO_2. Instead, the issue has been managed by the adoption of 'target' or 'critical' loads. These are similar to the objectives used in the management of other air pollutants, such as NOx. Although they are not legally enforceable, they do provide a goal towards which affected US States and Canadian Provinces are working, as emissions are reduced over time.
The severity of acid rain impact is generally measured by computing how much sulphate (a measure of sulphuric acid) falls on each hectare over one year. The target load for acid rain is expressed in terms of this amount of sulphate. In the late 1980s, the proposed target load for eastern Canada was 20 kilograms per hectare per year (kg/ha/yr). This target was initially designed to provide protection to areas which are moderately sensitive to acidification. This sensitivity varies in different areas, because geological characteristics such as soils and bedrock have different abilities to neutralise the acid precipitation. This is often referred to as the 'buffering capacity'.

Over time, scientists realised that these initial target loads were not adequate to provide long term protection, or protect more sensitive watersheds. The newer concept of critical loads was introduced in the 1990s. Critical loads take into account the nature of individual watersheds, and are calculated to ensure long-term protection from acidification. Critical loads for acidification in New Brunswick range from less than 8 up to 11 kg/ha/year of sulphate input (referred to as acid sulphate deposition). The lowest values of less than 8 kg/ha/yr are found in the most sensitive areas that typically have granite bedrock (e.g. areas of southwestern and central northern New Brunswick), and 11 kg/ha/yr in most of the rest of the Province.

In recent years, acidic deposition has been declining slowly. This means that the critical load values are beginning to be met over some parts of the Province, although still exceeded in others, notably the sensitive regions in the southwest. There is, however, still more effort required to reduce acid deposition further and ensure that the more sensitive lakes and rivers, such as those in southwestern N.B., are provided with long-term protection from acid damage. Further cuts in sulphur dioxide emissions are being pursued, both in the Province and those regions of eastern Canada and the United States which are the main source regions of these acid-causing emissions.

Acid deposition, the total amount of a chemical substance entering the environment, is a factor of both concentration in the precipitation and the amount of precipitation received. As a result, there will always be significant variability in acid deposition between years due to variability in weather patterns. Results presented in the following section on long-term trends indicate that when averaged across the province, the concentration of acidic pollutants in precipitation (which is less dependent of the amount of precipitation received) appears to be falling. Although encouraging, the data also show that the acid rain issue remains important in New Brunswick, as critical loads for acid rain continue to be exceeded, especially in the south. This remained true in 2005. Deposition values exceeded critical loads in most areas.

7. MOBILE AIR QUALITY MONITORING UNIT

To help in evaluating air quality in New Brunswick, the Department of the Environment has developed a mobile air quality monitoring unit. It augments monitoring carried out at established monitoring sites and can be moved to most areas of the province, fulfilling temporary monitoring needs. The vehicle is presently able to measure the following pollutants: sulphur dioxide, nitrogen oxides, ozone, total reduced sulphur (including hydrogen sulphide) and fine particulate matter (PM_{10} or $PM_{2.5}$). The vehicle is also fitted with a retractable 10-metre mast with wind speed and direction instruments

The mobile air monitoring vehicle is being used in the following applications:

- Assessment of the local impact of point or area emission sources
- An evaluation tool in responding to local air quality issues
- Site evaluation prior to establishing a permanent monitoring site
- Comparative analysis studies with permanent monitoring sites
- Validation of predictive air quality modelling studies
- Determination of background or baseline air quality
- Investigating a planned or sustained event that has potential for air quality impacts, e.g. slash burning, forest fire, fire training exercise.

2005 Operations

During 2005, the mobile unit was operated from July to September at Lamèque in northeastern New Brunswick, and at Little Ridge, near St Stephen, from October to December.

Monitoring results are summarized in the table on the following page. When interpreting the results, attention should be paid to the amount of time that monitors were operating in each month (indicated as "coverage" in the data tables).

A. Lamèque

Monitoring was conducted from July 12 to September 13 at Rue du Rivage, Lamèque. A few 1-h exceedances of TRS were noted in August and September, but concentrations were considerably lower than in previous years. Levels of other pollutants monitored were generally low. The most noteworthy readings include a 1-h average of 77 ppb for ozone seen on July 19, and high $PM_{2.5}$ readings on August 10 (24-hour averages above 30 micrograms per cubic metre). Both episodes appear to have been due to regional, transboundary air pollution events.

B. Little Ridge, near St Stephen

The mobile unit was stationed at Little Ridge from October 5 to December 13, 2005. Levels of all pollutants monitored were very low, with no exceedances noted.

Mobile Monitoring Unit – Data Summary 2005						
	Lamèque, rue du Rivage			Little Ridge, near St. Stephen		
	July	Aug	Sep	Oct	Nov	Dec
SO_2						
Coverage (%)	62	100	41	85	100	41
1-h exceedances (>170 ppb)	0	0	0	0	0	0
24-h exceedances (>56 ppb)	0	0	0	0	0	0
Peak 1-hour value (ppb)	5	48	57	3	6	3
Monthly mean (ppb)	--	2	--	0	1	--
TRS						
Coverage (%)	60	96	40	78	96	39
1-h exceedances (>11 ppb)	0	4	4	0	0	0
24-h exceedances (>3.5 ppb)	0	0	0	0	0	0
Peak 1-hour value (ppb)	0	20	19	1	1	3
Monthly mean (ppb)	--	0	--	0	0	--
NO_2						
Coverage (%)	60	100	41	82	100	41
1-h exceedances (>210 ppb)	0	0	0	0	0	0
24-h exceedances (>105 ppb)	0	0	0	0	0	0
Peak 1-hour value (ppb)	1	6	0	1	0	0
Monthly mean (ppb)	--	0	--	0	0	--
O_3						
Coverage (%)	62	100	41	15	99	40
1-h exceedances (>82 ppb)	0	0	0	0	0	0
Peak 1-hour value (ppb)	77	60	53	30	36	21
Monthly mean (ppb)	--	29	--	--	16	--
$PM_{2.5}$						
Coverage (%)	61	56	41	80	91	37
Max 24-h average (micrograms/cubic metre)	18	42	16	15	18	16
Mean (micrograms/cubic metre)	--	--	--	3.4	7.0	--

Note: "coverage" means the percentage of the hours in each month for which valid data were obtained.

8. LONG TERM AIR POLLUTION TRENDS

In addition to examining air quality monitoring results for a given year, it is often informative and revealing to compare annual results to previous years, and consider longer term trends. This provides information on how air quality may be changing over the years, and whether emission control measures as applied to industrial operations and consumer products (notably vehicles and fuels) are influencing long-term environmental quality. As mentioned in the introduction, air quality monitoring has been ongoing in parts of the province since the 1970s, especially in the Saint John region. In this section, data for key locations with long-term records are presented to provide information on air quality trends.

A. Carbon Monoxide

The only long-term site for this substance is the Customs Building site in uptown Saint John. The earlier part of the record (prior to 1991) is from the nearby Post Office location. Results are predominantly influenced by motor vehicle emissions. There are signs of a decrease from the 1980s in comparison with recent years. For example, the frequency of annual averages greater than 0.4 ppm has decreased. During the period in question the population of Saint John has increased approximately 4% (Aldighieri, 1998). The number of vehicles registered, and more notably, the average total kilometres driven each year, have been steadily increasing (Goggin, 1999; Transport Canada, 1999; Statistics Canada, 1999). These pressures, which tend to increase carbon monoxide emissions, have been offset by a greater proportion of vehicles fitted with emissions control equipment, such as catalytic converters. In 2005, results were the same as seen in 2003 and 2004.

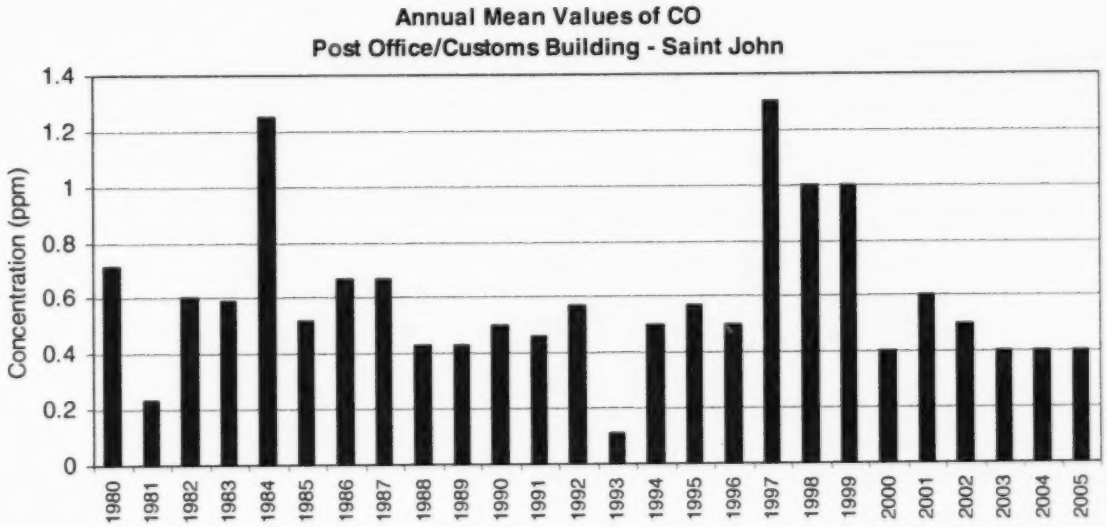


Figure 15. Annual mean values of carbon monoxide, Post Office/Customs Building, Saint John, 1980-2005.

Fredericton and Moncton

The record to date at these stations shows values similar to those recorded at the Saint John-Customs location, with the Moncton site having higher values. This may be a reflection of the influence of local sources such as the Université de Moncton heating plant, or proximity to the ring road. Results in 2005 were the same as 2004 in Fredericton, but lower in Moncton.

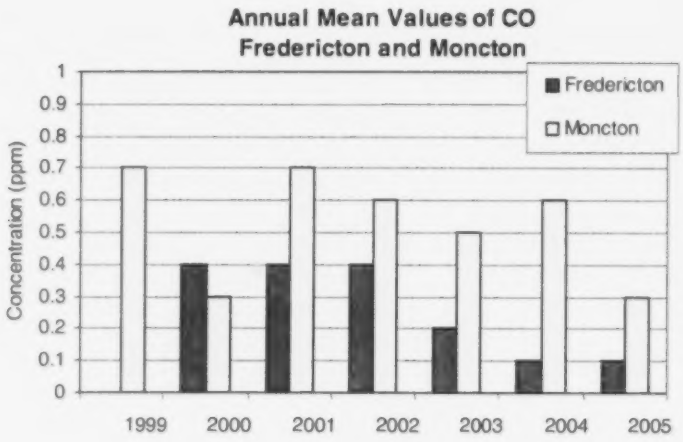


Figure 16. Annual mean values of carbon monoxide, Fredericton and Moncton, 1999 -2005.

B. Nitrogen dioxide

Forest Hills

Nitrogen dioxide is another key pollutant emitted by motor vehicles, as well as industrial sources. The trend at Forest Hills, in suburban east Saint John, appears to be downward since 1981, with some variation about a mean of approximately 5 ppb. Values in 2005 were the same as in 2004.

Forest Hills is influenced by emissions from local industries as well as the more diffuse sources such as vehicles.

Customs Building

In 2005, the annual mean fell again from the higher level seen in 2003 (thought to be due to increased construction activity in the area).

Fredericton and Moncton

The record for these centres is short, but is presented for comparison. NO_2 values appear to be higher on average at the Moncton station. 2005 results were similar to those in 2003 and 2004 at both Fredericton and Moncton.

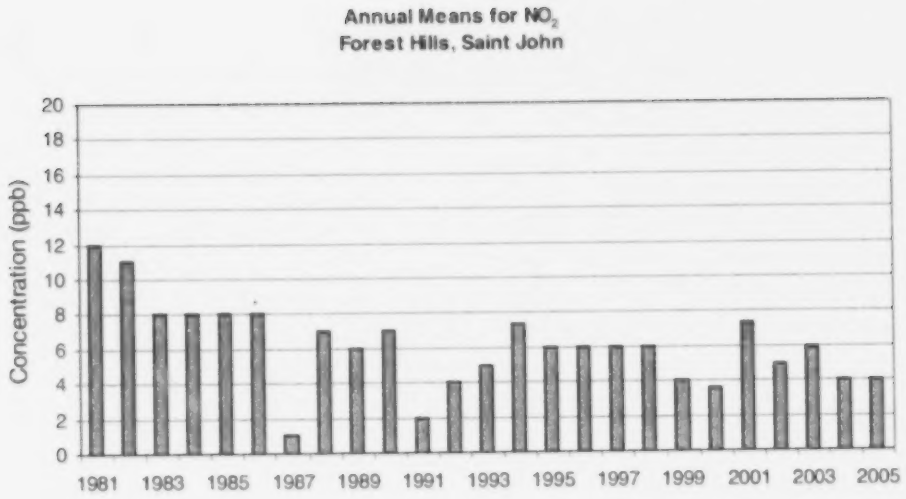


Figure 17. Annual mean nitrogen dioxide at Forest Hills, Saint John, 1981-2005.

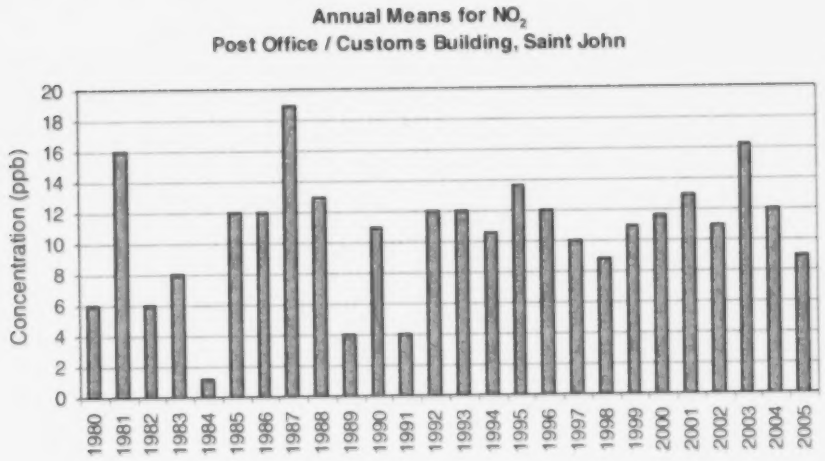


Figure 18. Annual mean nitrogen dioxide at Customs Building, Saint John, 1980-2005.

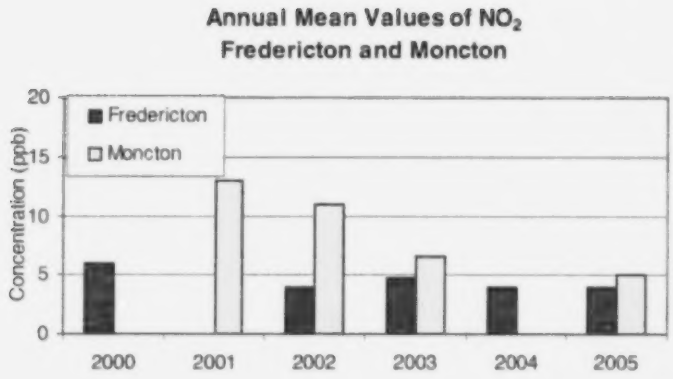


Figure 19. Annual mean nitrogen dioxide at Fredericton and Moncton, 2000-2005.

C. Sulphur dioxide

Forest Hills

Air quality monitored at the Forest Hills site in east Saint John is influenced by several local industries. Considering the trend since 1976, annual average concentrations have increased and decreased several times over the 22-year period, from 1976 to 1987 and from 1987 to 1996. In 2005, values were similar to those seen over the past few years and represent the lowest values yet recorded.

Influences on sulphur dioxide levels at this site include emissions from the Courtenay Bay generating station, the pulp and paper sector, the oil refinery and the Coleson Cove generating station.

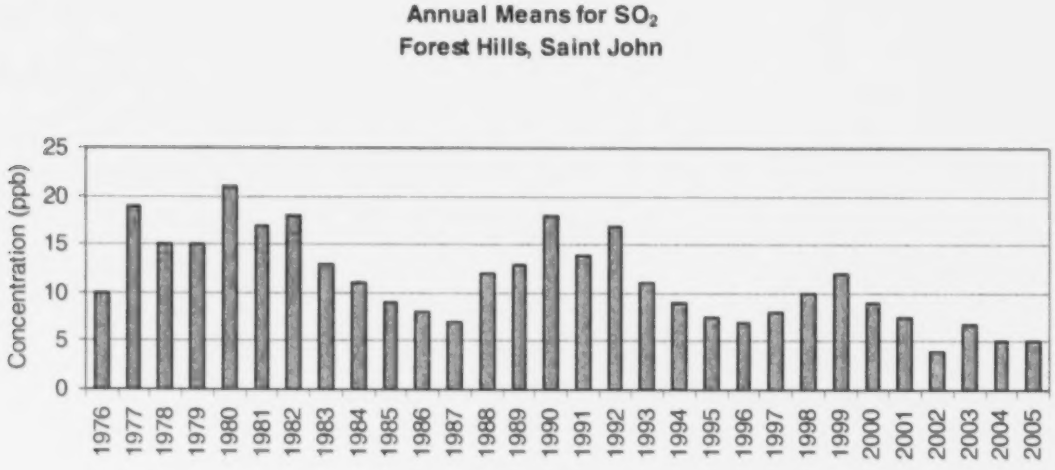


Figure 20. Annual mean sulphur dioxide at Forest Hills, Saint John, 1976-2005.

In uptown Saint John, as represented by records from the Post Office and Customs Building sites, the sulphur dioxide trend has been downward since the mid-1970s. Recently, levels have been approximately 30% of those common in the early 1980s. Decreasing concentrations in this part of the city are probably due to a variety of reasons, including reduced emissions from the Reversing Falls pulp and paper mill, which fell by about 70% from 1980 to 1995. Reduced emissions from the NB Power Courtenay Bay generating station (down 74% from 1990 to 1995) may also be partly responsible. Other reasons include the closure of the Lantic sugar refinery in 2002, new regulations reducing the sulphur content of gasoline, and the increasing use of natural gas.

The annual mean in 2005 was equal to the lowest in the record so far, continuing a downward trend since 1999.

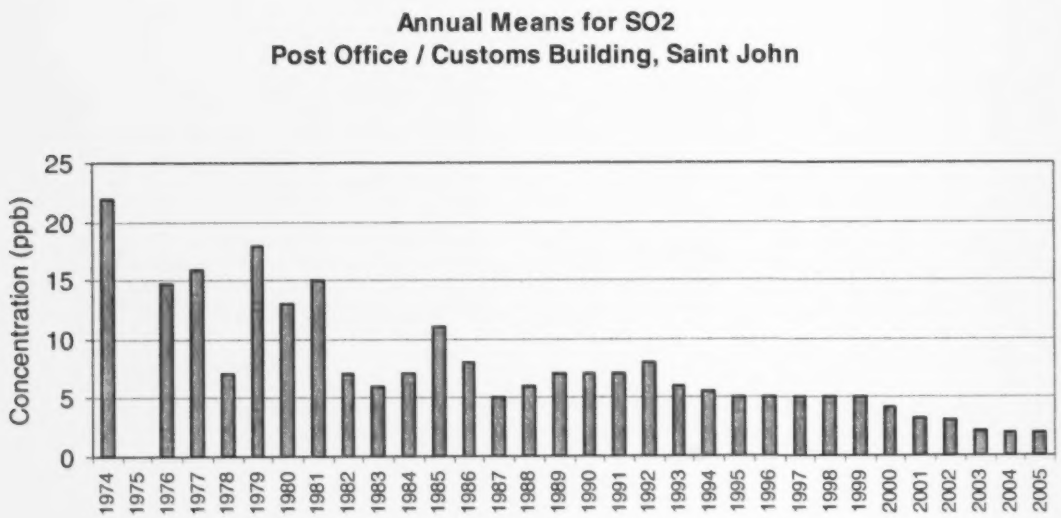


Figure 21. Annual mean sulphur dioxide at Post Office/Customs Building, Saint John, 1974-2005.

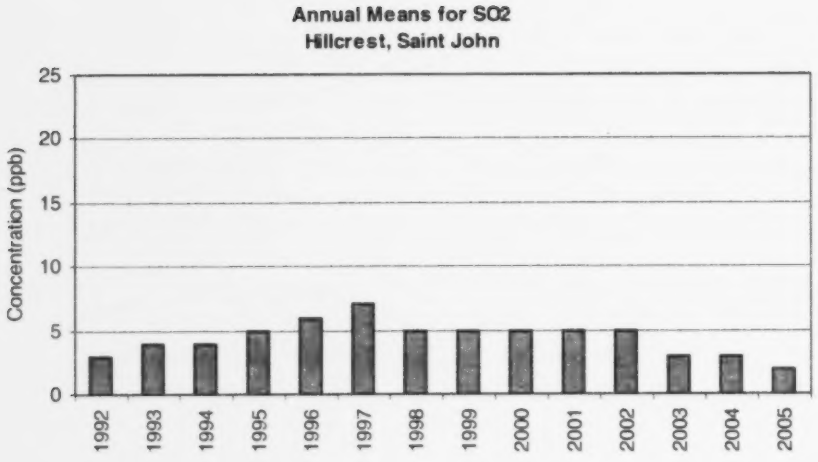


Figure 22. Annual mean sulphur dioxide at Hillcrest, Saint John, 1992-2005.

Hillcrest

This site in west Saint John is influenced by several sources of SO_2 including the Reversing Falls pulp and paper mill and the Moosehead brewery. Since 1992, the data show a rising trend until 1997 and then falling thereafter. In 2005 the annual mean was the lowest recorded.

Saint John – All sites

To examine the recent trend city-wide, a composite average of all sites in the Saint John network was calculated. This trend is shown in Figure 21. Four sites were operating in 1993-94, and seven sites 1995-2005.

This statistic shows a downward trend from 1997, with the exception of 2003. In 2005, the network-wide average fell to a level slightly below that in 2003 and 2004.

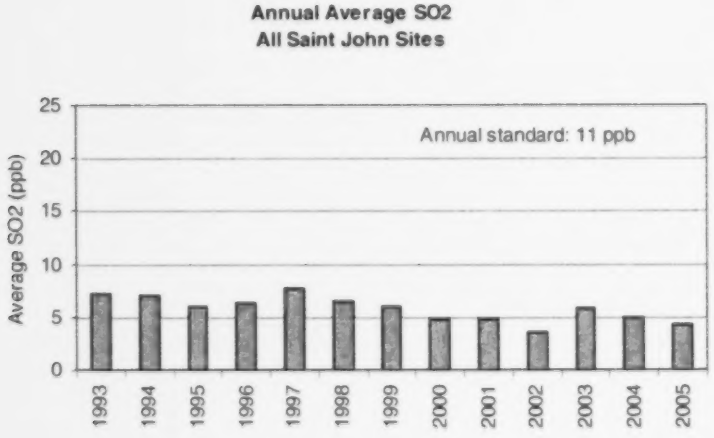


Figure 23. Trend in sulphur dioxide in Saint John: annual network average 1993-2005.

D. Ozone

As explained in section 4, ozone is a regionally transported pollutant which is not emitted directly from smokestacks or tailpipes, but which forms in the air when other pollutants mix and react together. As such, trends in ozone are due to changing emissions of the pollution ingredients that are required for ozone to be made (nitrogen oxides and volatile organic compounds) over a large upwind area of eastern Canada and the United States.

Seasonal weather, especially summer conditions, also has a major influence on the amount of ozone affecting New Brunswick.

Forest Hills

At Forest Hills, although ozone levels do not appear to have changed significantly overall in the past 19 years, there has been an increasing trend since 2000. This trend continued in 2005.

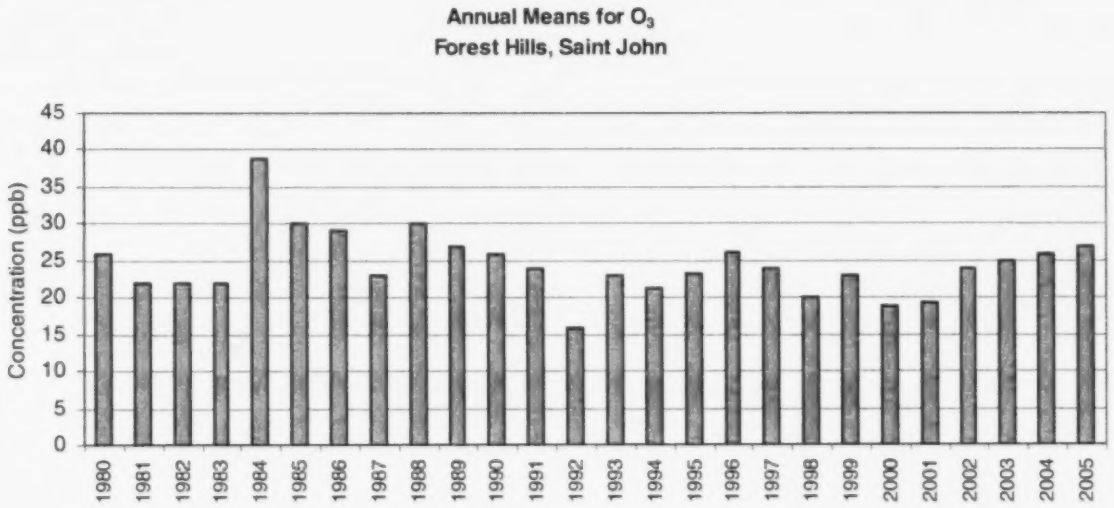


Figure 24. Annual mean ozone at Forest Hills, Saint John, 1980-2005.

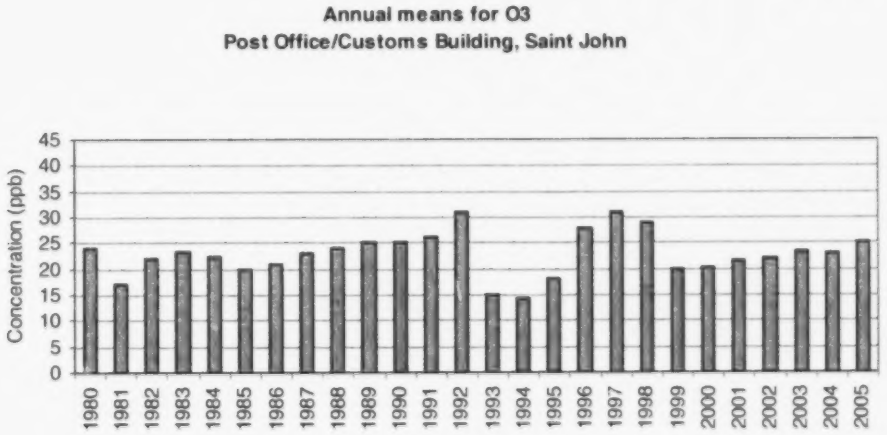


Figure 25. Annual mean ozone at Post Office/Customs Building, 1980-2005.

Customs Building

At the Customs site, annual averages for ozone have been variable since the early 1990s. Taking the most recent results into account, there is no clear trend to be seen over the period of record. However, as at Forest Hills, the 2005 results were higher than those seen over the last few years.

Point Lepreau

Data for this site are included to provide a perspective from a rural location which is almost always upwind of major sources of air pollutants in southern New Brunswick. Annual ozone levels are somewhat higher than those seen in the Saint John area. This is due to the lack of other emissions which react with and remove ozone from the air (mainly nitric oxide). The record at Point Lepreau reveals considerable variability between years The 2005 results were higher than in 2004 and the highest since 1990.

Provincial ozone trends

Figure 26 shows a composite trend based on all ozone sites in the province. The number of sites has increased substantially over the period of record, from two initially, to 13 in 2000. The latter half of the record is therefore more meaningful. Examining the entire record, a linear trend line indicates a slight increase (just over 2 ppb) in the annual average over the period 1980-2005.

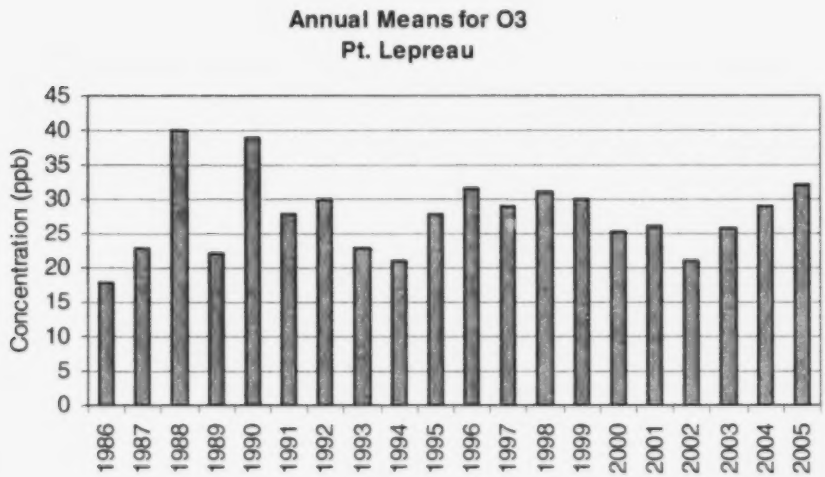


Figure 26. Annual mean ozone at Point Lepreau, 1986-2005.

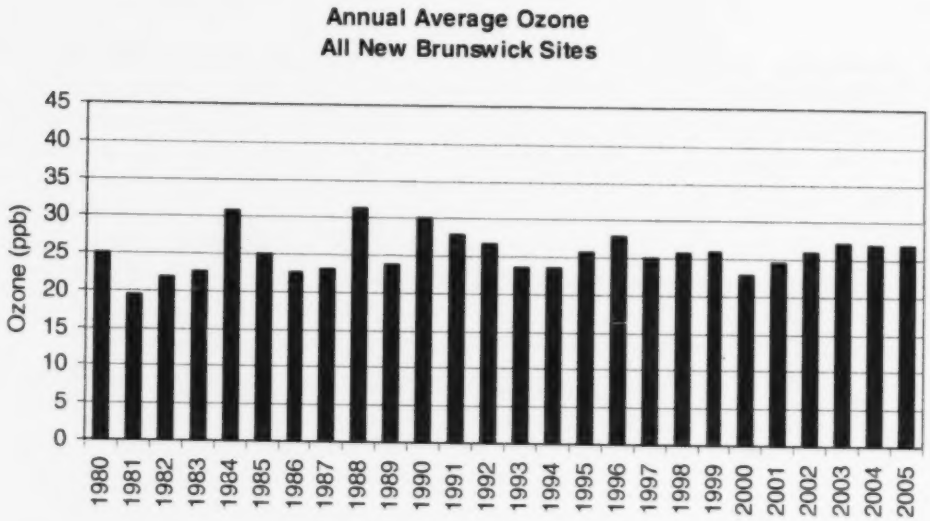


Figure 27. Annual average ozone concentrations based on all New Brunswick sites, 1980-2005.

E. PM_{10}

This section presents results obtained using high volume samplers.

Provincial Building

The long-term trend in PM_{10} for this site is shown in Figure 28. The annual mean for 2005 was similar to that seen in 2003 and 2004.

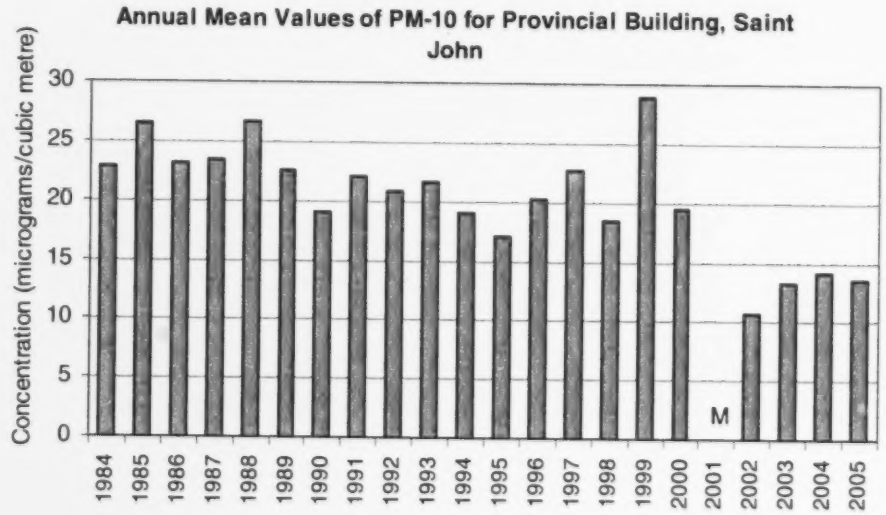


Figure 28. Annual mean PM_{10} at Provincial Building, Saint John, 1984-2005.
M = missing data.

F. Acid Rain

Since 1986, 27 separate sites have been operated for monitoring acid deposition across New Brunswick. Provincial coverage is presently maintained with 13 sites.

To provide a statistic which can give some indication of long-term changes or trends, the annual average sulphate concentration in precipitation was averaged across all sites operating in each year. The results are shown in the accompanying chart, which also shows the number of sites operating in each year. The trend is downward since 1989. This is expected, based on reductions in sulphur dioxide emissions in eastern Canada and the United States in the same time period.

In 2005, the provincial average sulphate concentration was the lowest since 2003.

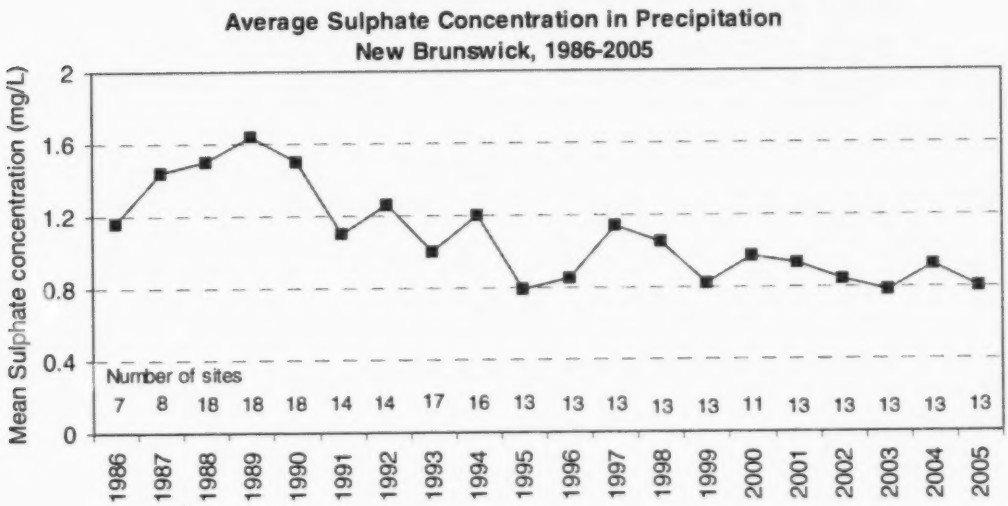


Figure 29. Network-wide mean annual sulphate concentration in precipitation in New Brunswick, 1986-2005.

G. Volatile Organic Compounds

VOCs have been measured at two locations (Forest Hills and Point Lepreau) since 1992, as noted in section 3. Routine analyses provide results for over 150 VOCs. In July 2000, sampling began at Champlain Heights School in east Saint John. Trends for selected VOCs are presented in this section.

One clear finding of the VOC sampling program is that concentrations of most VOCs are substantially higher at Forest Hills and Champlain Heights than at Point Lepreau. This is consistent with the location of Forest Hills in an industrial urban setting and Point Lepreau in a relatively remote, rural situation.

Figure 30 shows trends in average total VOC concentrations for all sites since 1992.

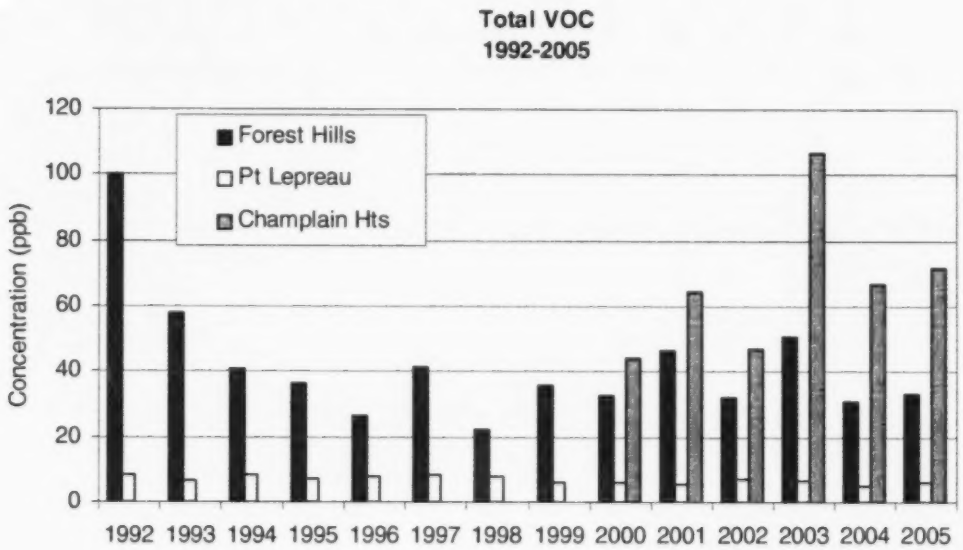


Figure 30. Average total VOC concentration at provincial VOC monitoring sites, 1992-2005.

These results clearly show the difference in average VOC levels between the sites. At Forest Hills, total VOC concentrations decreased from 1992 to 1998, and have risen slightly since then. There has been relatively little change at Point Lepreau. For the period 2001-2005 at Champlain Heights, VOC concentrations have increased about 20%. A longer period of record will be required to confirm whether or not this is a genuine trend.

Total VOC concentrations in 2005 at both Forest Hills and Champlain Heights were similar to those in 2004. Emissions from the refinery complex clearly influence both locations. Compounds such as butane and isopentane, which are major components of gasoline vapour, generally reflected the total VOC trend (Figure 31). Results for 2005 at both Forest Hills and Champlain Heights were similar to those seen in 2004.

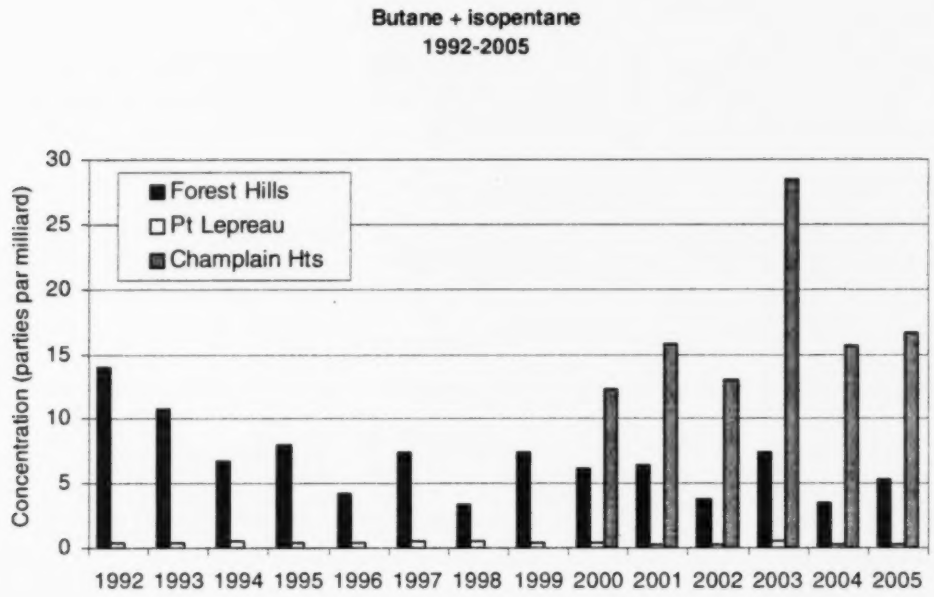


Figure 31. Annual average concentration of butane plus isopentane at provincial VOC monitoring sites, 1992-2005.

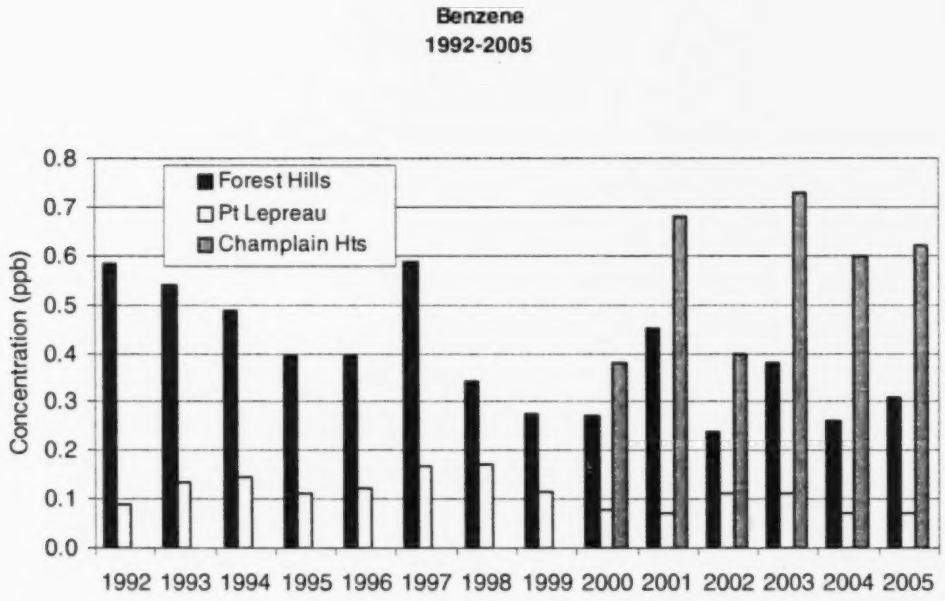


Figure 32. Annual average concentration of benzene at provincial VOC monitoring sites,1992-2005.

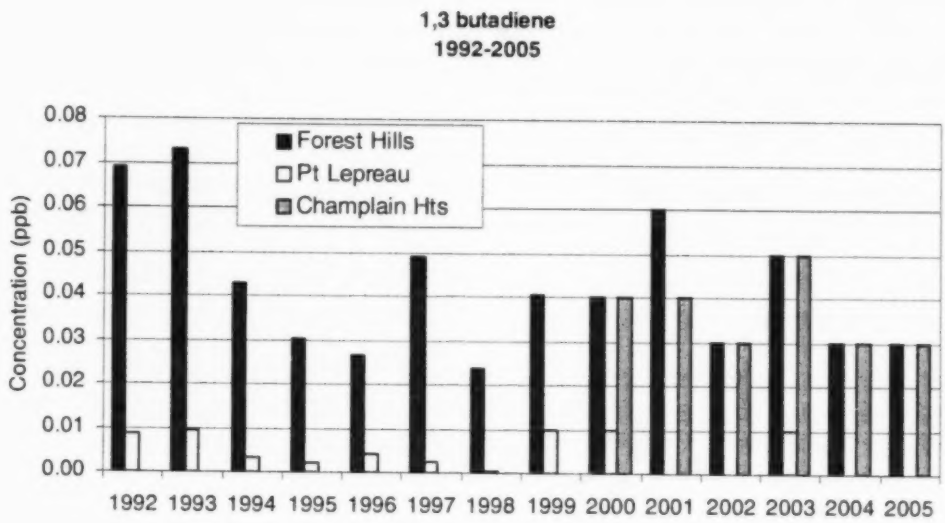


Figure 33. Annual average concentration of 1,3 butadiene at provincial VOC monitoring sites, 1992-2005.

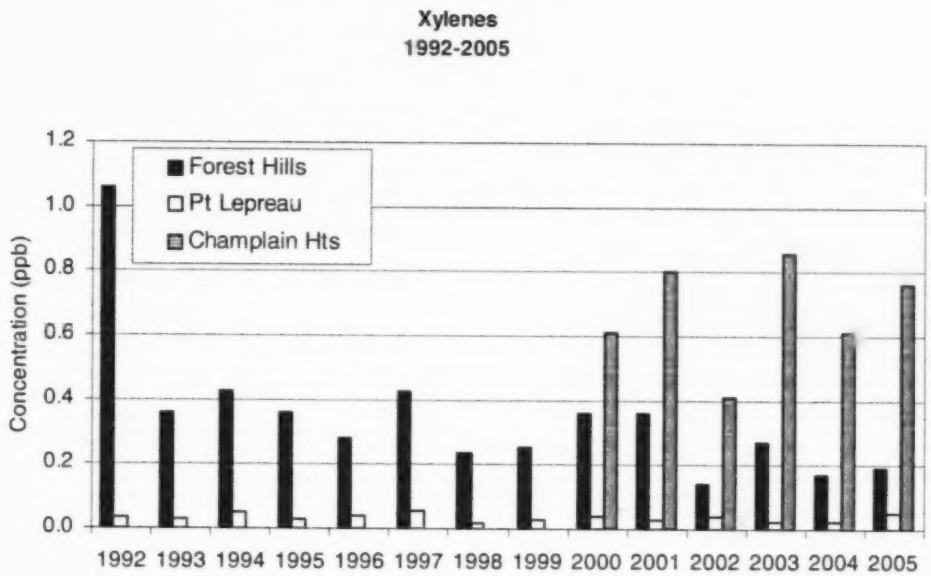


Figure 34. Annual average concentration of xylenes at provincial VOC monitoring sites, 1992-2005.

Some potentially toxic VOCs decreased from the early to the late 1990s, and have been more variable since then. Figure 32 shows the trend for benzene, Figure 33 for butadiene and Figure 34 for xylenes. In each case there is little apparent trend at the rural Lepreau site.

Benzene is an important component of gasoline. Benzene increased slightly in 2005 at both urban sites. Benzene concentrations are consistently about 40%-50% higher at Champlain Heights than at Forest Hills.

Butadiene is emitted during petroleum refining and subsequent handling, as well as from internal combustion engines (e.g. CARB, 1992). Butadiene was unchanged at both sites in 2005 compared to the previous year. Butadiene concentrations appear similar at both urban sites. The long-term trend for butadiene essentially follows that for benzene.

Xylenes are associated with vehicle exhaust (Multistakeholder NOx/VOC Science Program, 1997a). Xylene concentrations were slightly higher at both sites in 2005. Considering the long-term trend, xylene concentrations do not appear to have changed as much since 1993 as some of the other key VOCs.

The oil refinery began a leak test and repair program in 1995, designed to reduce VOC emissions from leaking equipment such as pumps and valves. This may have been a factor in the observed decreases of many VOCs, although the bulk of the decrease took place between 1992 and 1995. Other changes may have had some influence, such as an increasing proportion of vehicles on the road being equipped with emission control devices. The increases since 2000 are probably linked to the overall expansion of the refinery, and may also be affected by changes in other VOC emission sources in the area (e.g. other industry in the Grandview industrial park, road traffic, construction traffic).

In the table on the following page, additional background information is provided on VOCs that are of special concern. These compounds are found on the "priority lists" of many nations, states and provinces, for special attention in term of control programs, including actions such as minimising use, emissions, and human exposure.

It is apparent that a lot of these compounds have features in common. Many are found in crude oil or are produced as part of the petroleum refining process and they are often used as solvents, or in paint or plastics. Burning is also a potential source of many of these VOCs. Although these compounds have been identified for priority attention, in many cases there is still relatively little information available on their toxicity. In such cases they are often not classifiable in terms of cancer-causing potential, and sufficient detail may not be available to determine if ambient air quality guidelines should be established. For many of the VOCs in this list, technical data sheets note that they may affect the nervous system. In cases where this is known from clinical trials or actual human exposure, it is usually at very high concentrations, much greater than what would be found in the outdoor environment.

Additional Information on VOCs of Special Concern			
	Cancer-causing	Sources	Other details
1,3 butadiene	Yes (OSHA)	Refining, gasoline, plastics industry, rubber manufacturing, burning.	Most is used to make synthetic rubber.
Benzene	Yes (OSHA, IARC, EPA). Linked with leukaemia.	Refining, gasoline, burning, coal coking.	High-volume industrial compound.
Toluene	No, or unclassifiable (EPA)	Refining, gasoline, solvents,	High levels can affect the nervous system.
Ethylbenzene	No, or unclassifiable (EPA)	Petroleum products, adhesives, paint.	Limited health impact information available.
Xylenes	Insufficient information to classify (EPA, IARC)	Solvents, printing, paint, vehicle exhaust	High levels can affect the nervous system.
Styrene	Possibly (IARC)	Plastics industry.	High-volume substance used in many products containing plastic or insulation.
Chloromethane	Possibly (EPA)	Burning, natural sources, swimming pools	High levels can injure the nervous system.
Vinyl chloride	Yes (OSHA). Linked to cancer of liver, brain and lung.	Plastics industry.	No natural sources. Used to make PVC.
1,1 dichloroethylene	Suspected (EPA)	Adhesives and packaging material manufacture.	High levels can cause liver and kidney damage.
Dichloromethane	Probable (EPA), "may cause cancer" (WHO)	Paint stripper, industrial solvent.	No natural sources.
1,2 dichloroethane	Potential (EPA)	Solvent use, plastics and textiles manufacture.	Can cause nervous system disorders and adverse lung, liver and kidney effects.
Carbon tetrachloride	Possibly (IARC), probable (EPA)	Most uses banned. Formerly widely used as a solvent, propellant, and fire extinguishing agent.	No natural sources. Stable from 30-100 years in the atmosphere.
1,2 dichloropropane	Not classifiable (IARC)	Relatively few uses. Chemical intermediate for making other compounds.	No natural sources. High levels may cause organ failure or lung damage.
Trichloroethylene	Probable (IARC)	Paint, solvent use.	No natural sources, but persistent in the environment, especially in soils and groundwater.
1,1,2 trichloroethane	Not classifiable (IARC)	Solvent use, and used as a chemical intermediate	Persistent in groundwater; breaks down slowly in air.
Ethylene dibromide	Potential (EPA)	Pesticide and solvent use. Dye manufacture.	Known to affect the liver, stomach and testes.
Tetrachloroethylene	"May be reasonably anticipated to be" (DHHS)	Dry cleaning, metal de-greasing	High concentrations affect the nervous system.
1,1,2,2 tetrachloroethane	Possible (EPA)	Chemical intermediate.	No longer used as an end product. Previously used as a solvent and in pesticides.
Formaldehyde	Yes (OSHA)	Used in plastic resins, plywood, paper and fertilizers.	Also found in photochemical smog. Can irritate eyes, nose and throat..
Acetaldehyde	Probable (EPA, IARC)	Acetic acid manufacture.	Many uses, including as a food additive.
MTBE	Not classified by IARC, EPA or DHHS.	Gasoline additive.	Characteristic turpentine-like smell. Contaminates and persists in groundwater.

Notes: EPA = United States Environmental Protection Agency; IARC = International Agency for Research on Cancer; DHHS = US Department of Health and Human Services. Where sources are given, the list provides major examples but is not exhaustive. In most cases there will be additional sources.

9. QUALITY ASSURANCE

The provincial air quality network quality assurance program consists of a number of components, with input and responsibility from both DENV and Environment Canada. Sites managed by DENV are operated according to procedures and methods endorsed by the National Air Pollution Surveillance (NAPS) program, headquartered in Ottawa.

The objective of quality assurance procedures is to provide accurate, representative, comparable, high data quality using consistent operational protocols and standards. The NAPS agency provides calibration, reference standards, and technical support to DENV. Performance audits are also carried out annually. Calibration gases are certified for accuracy and are either "primary reference standards" or are traceable to primary standards maintained by the National Institute of Standards and Technology (NIST) in Maryland.

Instrumentation technologies used in both the provincial and industry networks must satisfy the requirements of the United States Environmental Protection Agency (EPA) as equivalent or reference method for ambient air monitoring. Methods not yet certified by the EPA are used if approved and tested by the NAPS agency.

Quality assurance tasks in the operation of monitoring stations include regular site inspections, instrument response verifications and analyzer calibrations.

Air quality monitoring analysers are specialised instruments, requiring regular maintenance to ensure acceptable operation. In addition, calibration procedures are necessary to ensure accurate results are obtained. For instruments measuring pollutants in gas form, calibration involves introducing known concentrations of the pollutant gas to the analyser, and monitoring the response. Three or four concentration values are used when performing such a "multipoint" calibration. Certified flow, temperature and pressure standards are used for equipment which measures particulate matter.

Audits of sites operated by DENV are performed by Environment Canada on randomly selected sites within the provincial network. An interlaboratory testing program is also conducted annually. This consists of the analysis of gases supplied "blind" (i.e. with no information on the true concentration) by the NAPS laboratory. DENV technicians analyze the blind test gas using their calibration equipment and send the results to NAPS, who return a report on performance to the province. This serves to standardize the performance of calibration systems within the province and across the country.

Performance and system/operator audits are carried out by DENV every two years to ensure acceptable data quality. Industry network audits are performed every one or two years, using NAPS certified standards (see the following section).

After data have been acquired, they are all validated. This involves examining results, taking into account instrument records, especially "zero and span drift" (measures of internal instrument changes), other site records, maintenance procedures, calibration of the analyzers, adjustments made to operating settings, performance and history of the analyzers, seasonal conditions, and changes and levels of other pollutants during a given time frame.

Audits of Industry-operated sites

To ensure data quality, DENV technicians visit the monitoring sites operated by industries in New Brunswick, and perform independent site audits. It is normal to check all operating analysers at least once per year, or more often if required. Audits help identify and solve problems, prevent problems from developing, and assure data quality within the provincial monitoring system.

Results of air quality monitoring audits in 2005 are summarised in the following tables. A total of 32 instrument audits were carried out in 2005.

AIR QUALITY SITE AUDITS – 2005					
Industry	**Site**	**Parameter**	**Date**	**Absolute difference from standard (%)**	**Pass/fail**
AV cell	Boom Rd.	SO_2	Dec 5 05	5.8	P
	Dairy Queen	SO_2	Dec 5 05	8.6	P
Fraser Inc/Nexor Edmundston	Cormier School	SO_2	Nov 28 05	9.0	P
	Cormier School	TEOM $PM_{2.5}$	Nov 28 05	5.5	P
	St Mary	SO_2	Nov 28 05	7.0	P
St-Anne Nackawic	Caverhill Rd	TRS	Not operating		
	Caverhill Rd	SO_2	Not operating		
Irving Pulp and Paper	Sherbrooke St	TRS	Nov 24 05	25.0	F (note 1)
	Sherbrooke St	SO_2	Nov 24 05	15.0	P
	Indiantown	TRS	Nov 30 05	10.0	P
Irving Oil Limited	Champlain Heights	BAM $PM_{2.5}$	Jun 27 05	3.0	P
NB Power Millbank	Lower Newcastle	NO_2	Jun 17 05	6.0	P
	Lower Newcastle	SO_2	Jun 17 05	3.0	P
	Rockcliff	NO_2	Jun 17 05	25.0	F (note 2)
	Rockcliff	SO_2	Jun 17 05	9.0	P
NB Power Dalhousie	Pointe la Nim	SO_2	Dec 7 05	14.0	P
	Pointe à la Garde	SO_2	Dec 7 05	10.0	P
	Mobile/ Pt. La Nim	SO_2	Dec 8 05	14.0	P
	Bayview	SO_2	Dec 7 05	8.0	P

Notes: Details of corrective action taken when analyzers failed an audit: (1) Service and recalibration Jan 11, 2006. (2) Replaced with calibrated spare, June 30 2006. Instruments testing +/-15% are considered to be providing invalid data and require service/recalibration. Instruments testing +/-10% are identified for service and recalibration, with data considered acceptable.

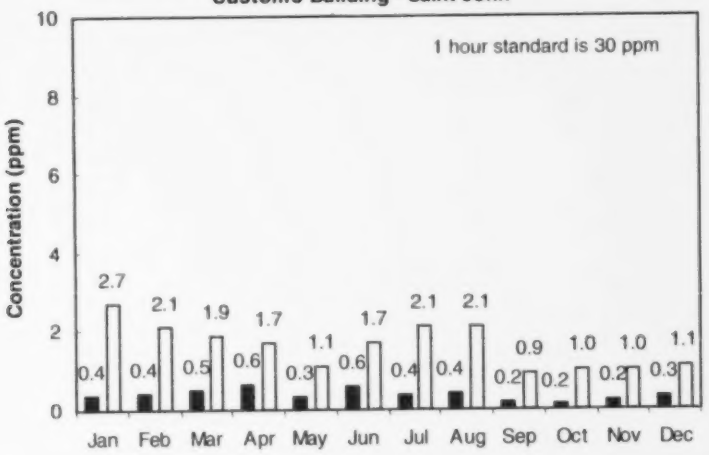
AIR QUALITY SITE AUDITS – 2005					
Industry	**Site**	**Parameter**	**Date**	**Absolute difference from standard (%)**	**Pass/fail**
NB Power Belledune	Municipal Bldg	NO_2	Nov 16 05	7.0	P
	Municipal Bldg	SO_2	Nov 16 05	5.4	P
	Belledune East	NO_2	Dec 18 05	4.3	P
	Belledune East	SO_2	Dec 18 05	2.6	P
	Madran	SO_2	Nov 17 05	5.8	P
	Pointe Verte	SO_2	Nov 17 05	4.3	P
NB Power Grand Lake	Flowers Cove	SO_2	Dec 16 05	3.0	P
	Newcastle Centre	SO_2	Dec 19 05	1.5	P
	Cox Point	SO_2	Dec 16 05	0.5	P
	Bailey Point	SO_2	Dec 19 05	2.0	P
Brunswick Smelter (Belledune)	Chalmers	SO_2	Dec 6 05	3.0	P
	Boulay Farm	SO_2	Dec 6 05	3.4	P
	Town Site	SO_2	Dec 6 05	4.0	P
Weyerhaeuser (Miramichi)	Hay Lane	BAM $PM_{2.5}$	Sep 12 05	1.0	P
	Fire Ponds	BAM $PM_{2.5}$	Sep 12 05	1.8	P

Notes: Instruments testing +/-15% are considered to be providing invalid data and require service/ recalibration. Instruments testing +/-10% are identified for service and recalibration, with data considered acceptable.

APPENDIX I:
DETAILED MONTHLY MONITORING RESULTS FOR 2005

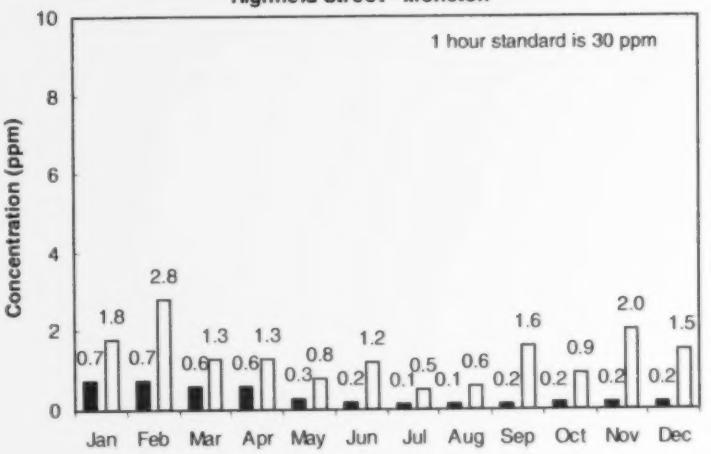
Monthly average and maximum 1 hour values of Carbon Monoxide in 2005

Customs Building - Saint John



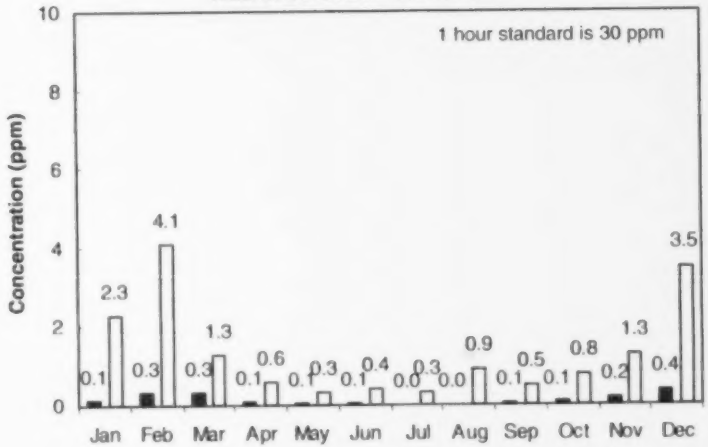
Monthly average and maximum 1 hour values of Carbon Monoxide in 2005

Highfield Street - Moncton



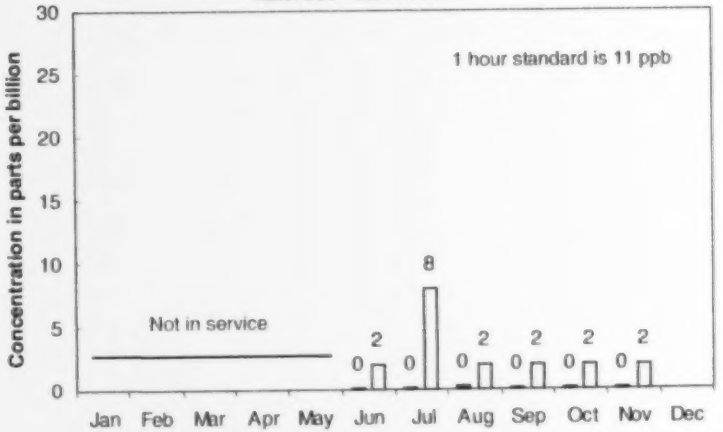
Monthly average and maximum 1 hour values of Carbon Monoxide in 2005

Aberdeen Street - Fredericton

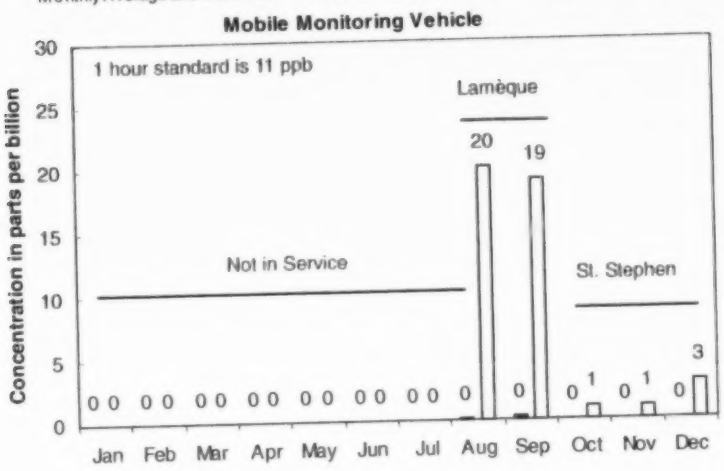


Monthly Average and Maximum One Hour Values of Total Reduced Sulphur in 2005

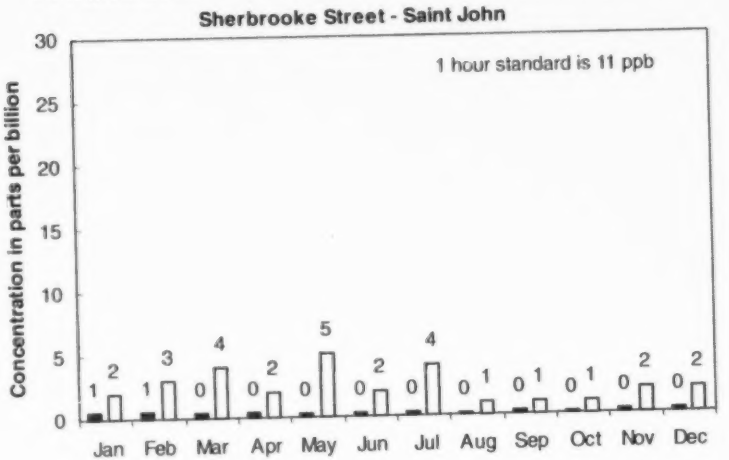
Hillcrest - Saint John


1 hour standard is 11 ppb
Concentration in parts per billion
0 5 10 15 20 25 30
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Not in service
0 2
0 8
0 2
0 2
0 2
0 2

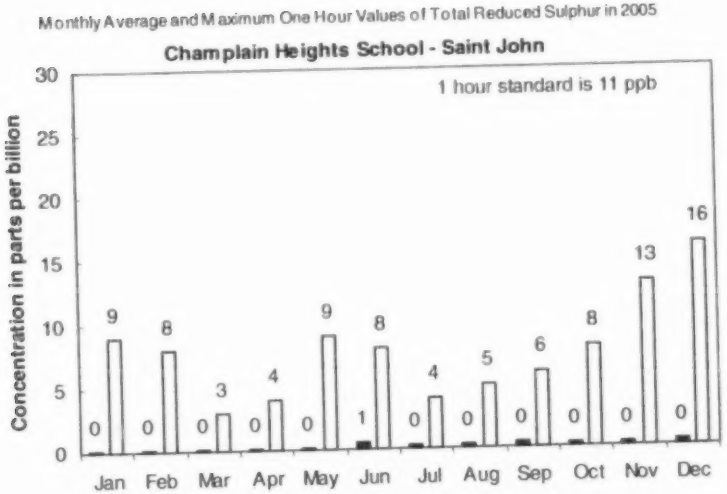
Monthly Average and Maximum One Hour Values of Total Reduced Sulphur in 2005


Mobile Monitoring Vehicle
1 hour standard is 11 ppb
Lamèque
Not in Service
St. Stephen
Concentration in parts per billion
0 0 0 0 0 0 0 0 0 0 0 0 20 0 0 1 0 1 0 3
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

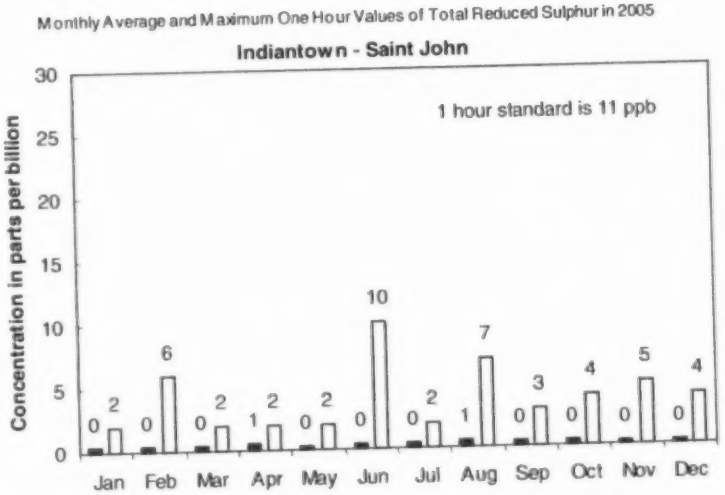
Monthly Average and Maximum One Hour Values of Total Reduced Sulphur in 2005


Sherbrooke Street - Saint John
1 hour standard is 11 ppb
Concentration in parts per billion
1 2 1 3 0 4 0 2 0 5 0 2 0 4 0 1 0 1 0 1 0 2 0 2
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

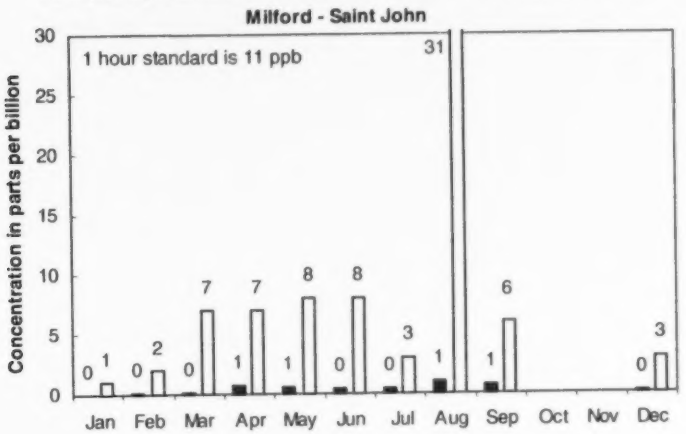
Monthly Average and Maximum One Hour Values of Total Reduced Sulphur in 2005


Champlain Heights School - Saint John
1 hour standard is 11 ppb
Concentration in parts per billion
0 9 0 8 0 3 0 4 0 9 1 8 0 4 0 5 0 6 0 8 0 13 0 16
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

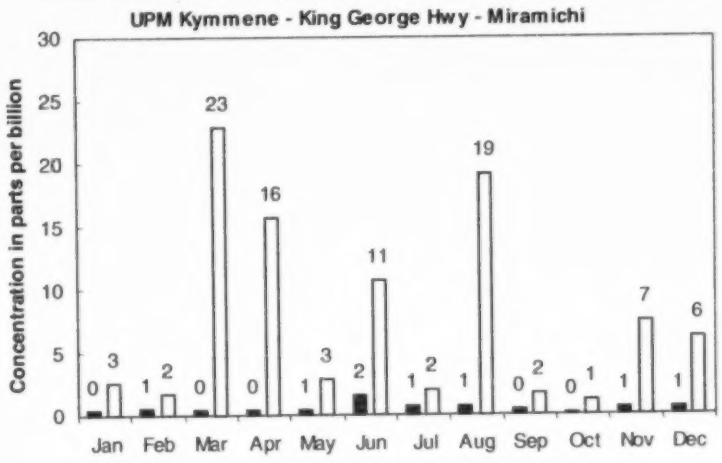
Monthly Average and Maximum One Hour Values of Total Reduced Sulphur in 2005


Indiantown - Saint John
1 hour standard is 11 ppb
Concentration in parts per billion
0 2 0 6 0 2 1 2 0 2 0 10 0 2 1 7 0 3 0 4 0 5 0 4
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

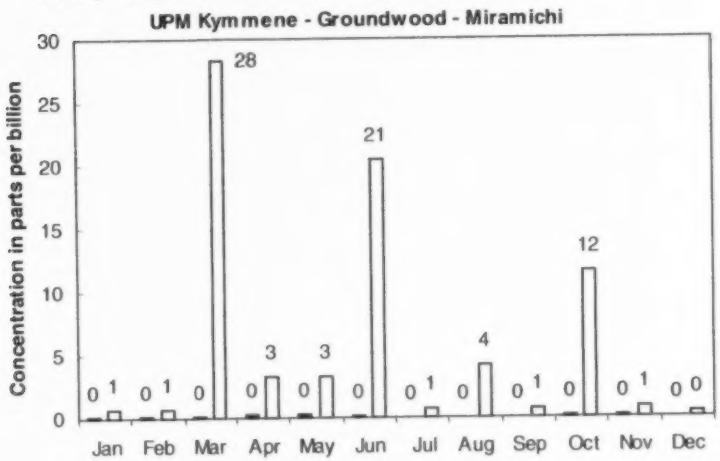
Monthly Average and Maximum One Hour Values of Total Reduced Sulphur in 2005


Milford - Saint John
1 hour standard is 11 ppb
Concentration in parts per billion
0 5 10 15 20 25 30
0 1 0 2 0 7 1 7 1 8 0 8 0 3 1 31 1 6 0 3
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

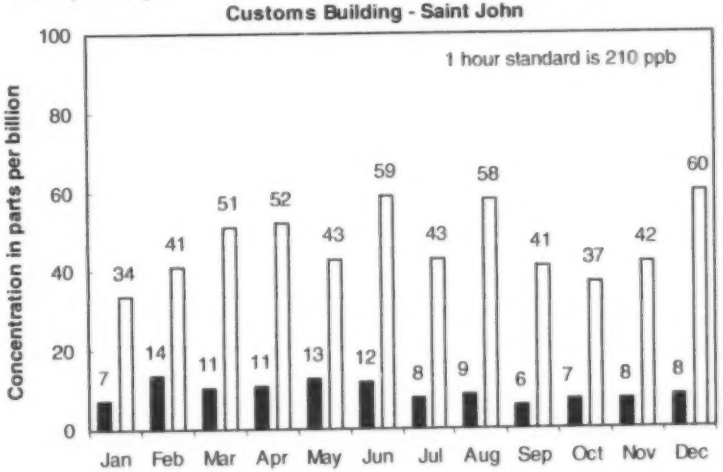
Monthly Average and Maximum One Hour Values of Total Reduced Sulphur in 2005


UPM Kymmene - King George Hwy - Miramichi
Concentration in parts per billion
0 5 10 15 20 25 30
0 3 1 2 0 23 0 16 1 3 2 11 1 2 1 19 0 2 0 1 1 7 1 6
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Monthly Average and Maximum One Hour Values of Total Reduced Sulphur in 2005

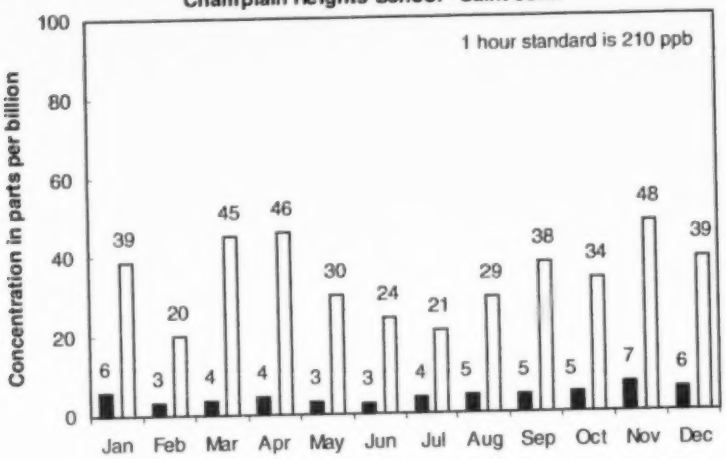

UPM Kymmene - Groundwood - Miramichi
Concentration in parts per billion
0 5 10 15 20 25 30
0 1 0 1 0 28 0 3 0 3 0 21 0 1 0 4 0 1 0 12 0 1 0 0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2005


Customs Building - Saint John
1 hour standard is 210 ppb
Concentration in parts per billion
0 20 40 60 80 100
7 34 14 41 11 51 11 52 13 43 12 59 8 43 9 58 6 41 7 37 8 42 8 60
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

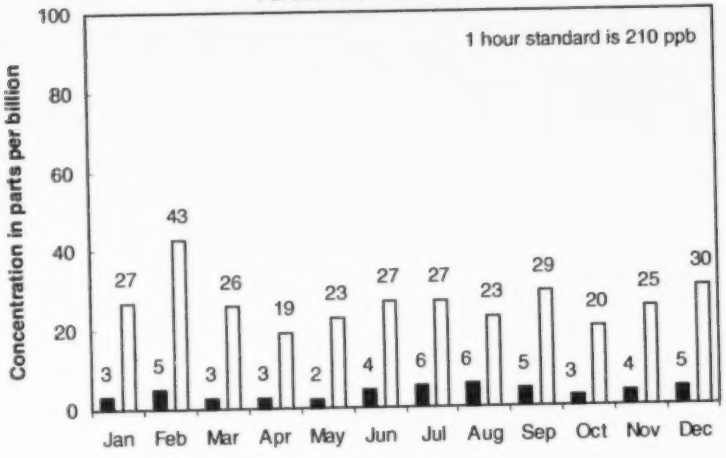
Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2005

Champlain Heights School - Saint John



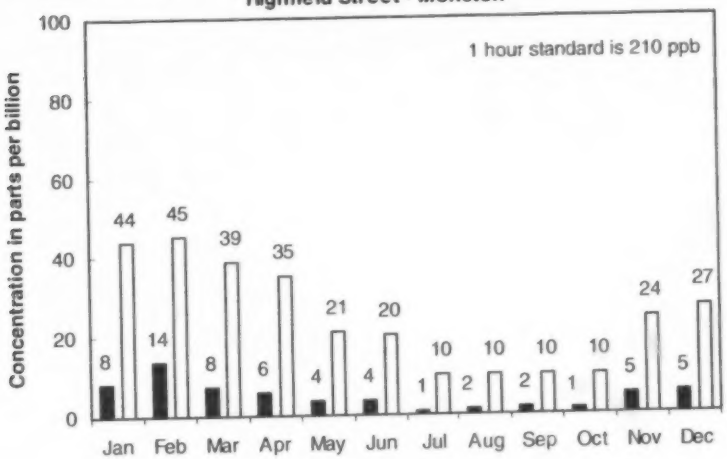
Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2005

Forest Hills - Saint John



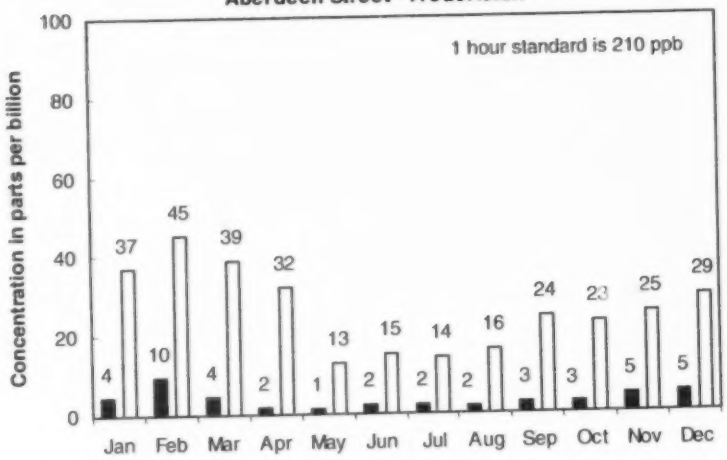
Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2005

Highfield Street - Moncton



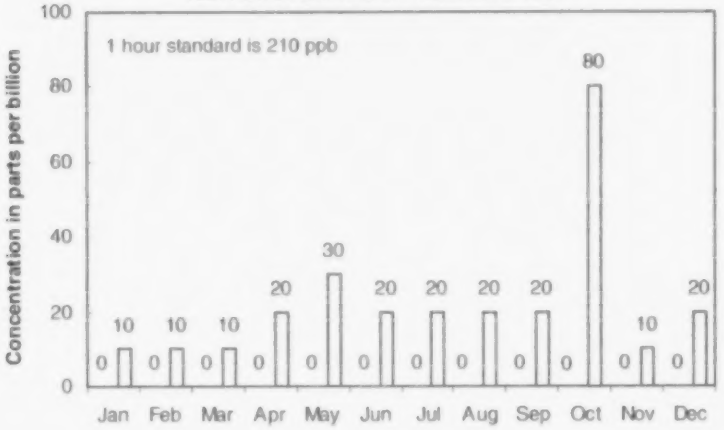
Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2005

Aberdeen Street - Fredericton



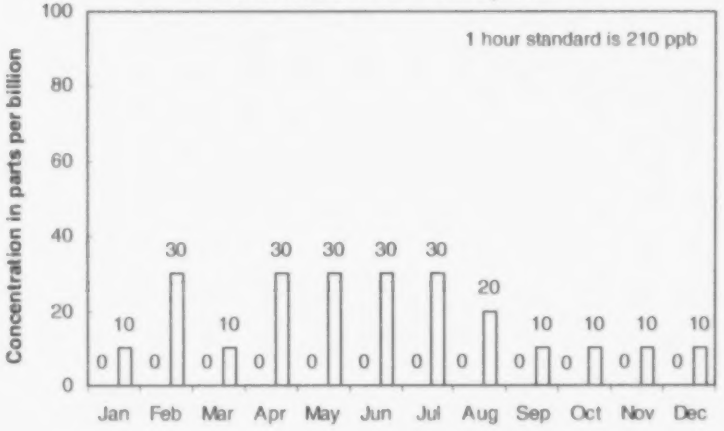
Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2005

N.B. Power Belledune - Belledune East


1 hour standard is 210 ppb
Concentration in parts per billion
100
80
60
40
20
0
0 10 0 10 0 10 0 20 0 30 0 20 0 20 0 20 0 20 0 80 0 10 0 20
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

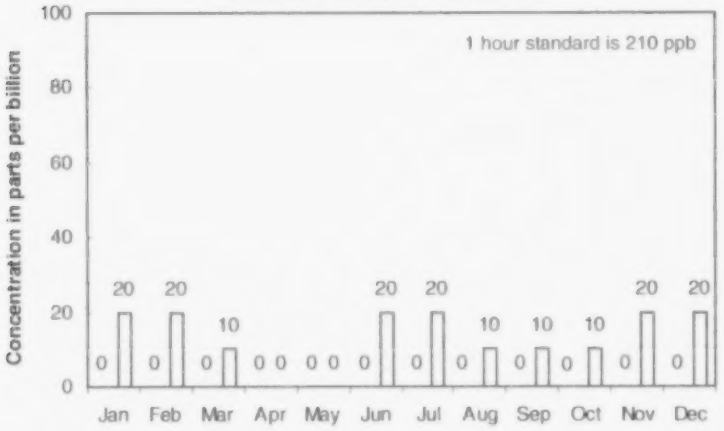
Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2005

N.B. Power Belledune - Municipal Hall


1 hour standard is 210 ppb
Concentration in parts per billion
100
80
60
40
20
0
0 10 0 30 0 10 0 30 0 30 0 30 0 30 0 20 0 10 0 10 0 10 0 10
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

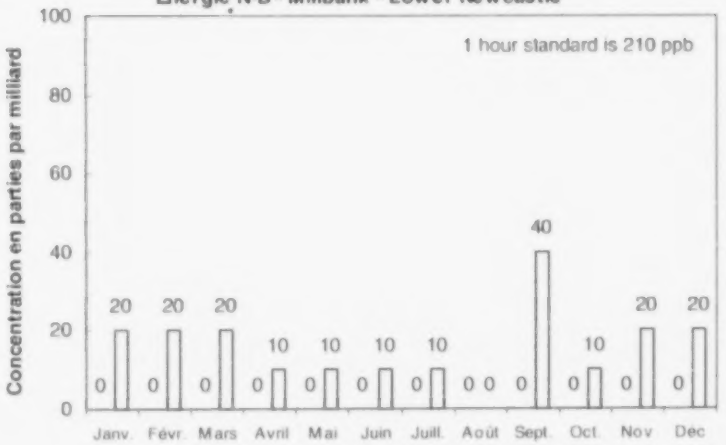
Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2005

N.B. Power Millbank - Rockcliff


1 hour standard is 210 ppb
Concentration in parts per billion
100
80
60
40
20
0
0 20 0 20 0 10 0 0 0 0 0 20 0 20 0 10 0 10 0 10 0 20 0 20
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

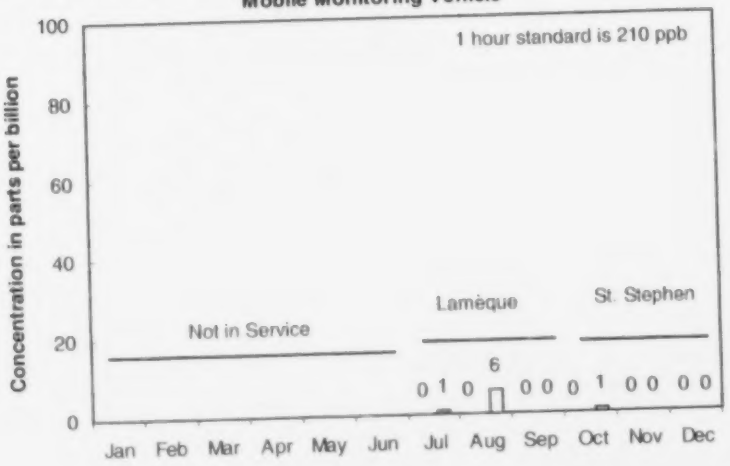
Moyenne mensuelle et concentration maximale horaire de NO_2 en 2005

Énergie N-B - Millbank - Lower Newcastle


1 hour standard is 210 ppb
Concentration en parties par milliard
100
80
60
40
20
0
0 20 0 20 0 20 0 10 0 10 0 10 0 10 0 0 0 40 0 10 0 20 0 20
Janv. Févr. Mars Avril Mai Juin Juill. Août Sept. Oct. Nov Déc

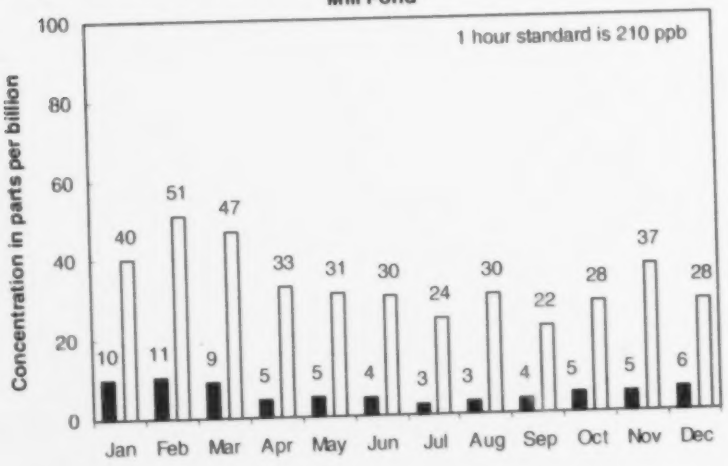
Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2005

Mobile Monitoring Vehicle



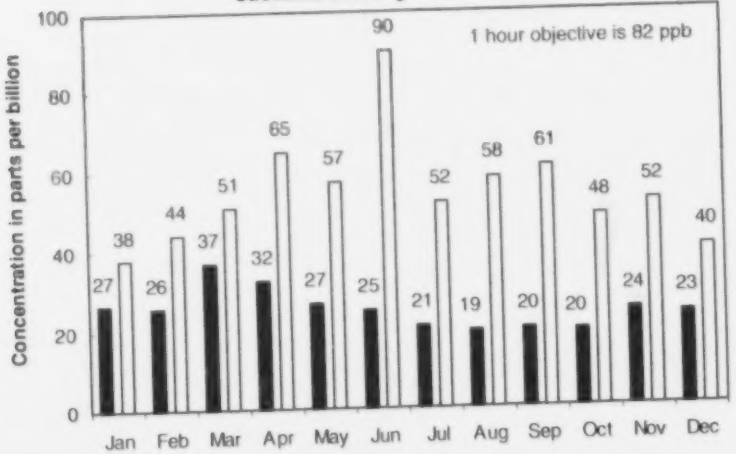
Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2005

Mill Pond


1 hour standard is 210 ppb
Concentration in parts per billion
100
80
60
40
20
0
10 40 11 51 9 47 5 33 5 31 4 30 3 24 3 30 4 22 5 28 5 37 6 28
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

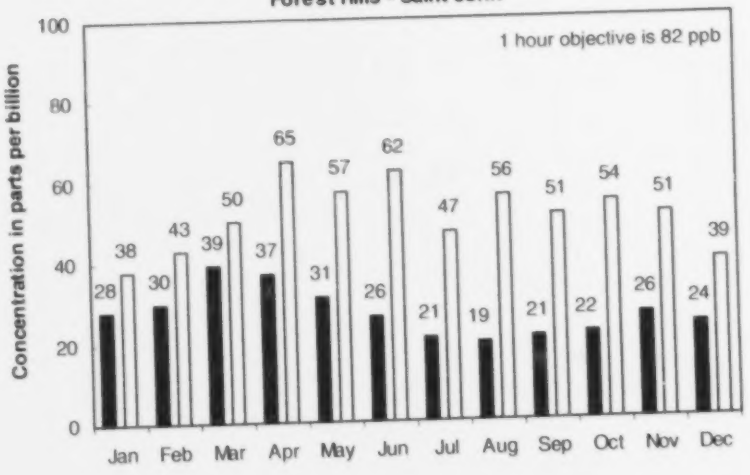
Monthly Average and Maximum One Hour Values of Ozone in 2005

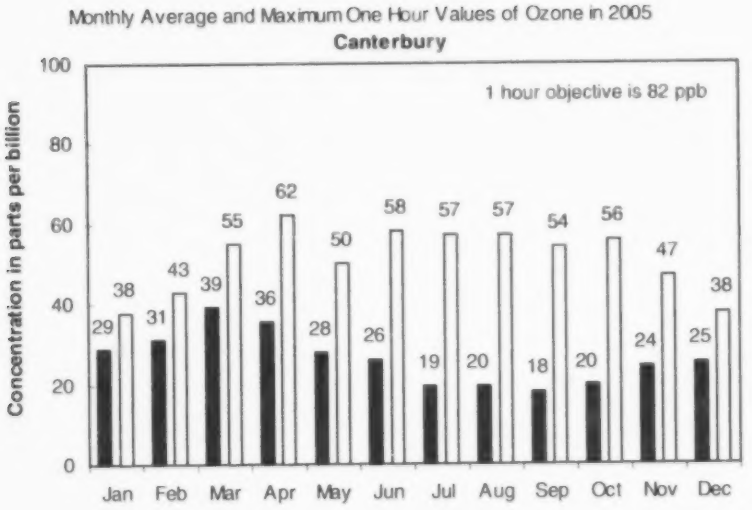
Customs Building - Saint John

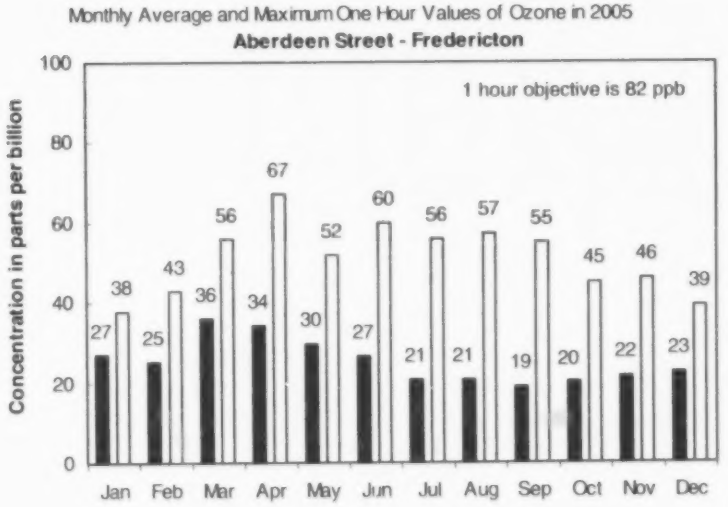

1 hour objective is 82 ppb
Concentration in parts per billion
100
80
60
40
20
0
27 38 26 44 37 51 32 65 27 57 25 90 21 52 19 58 20 61 20 48 24 52 23 40
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

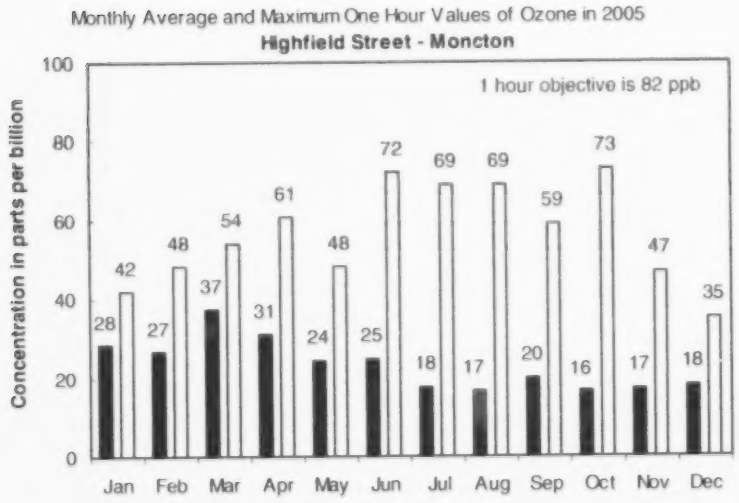
Monthly Average and Maximum One Hour Values of Ozone in 2005

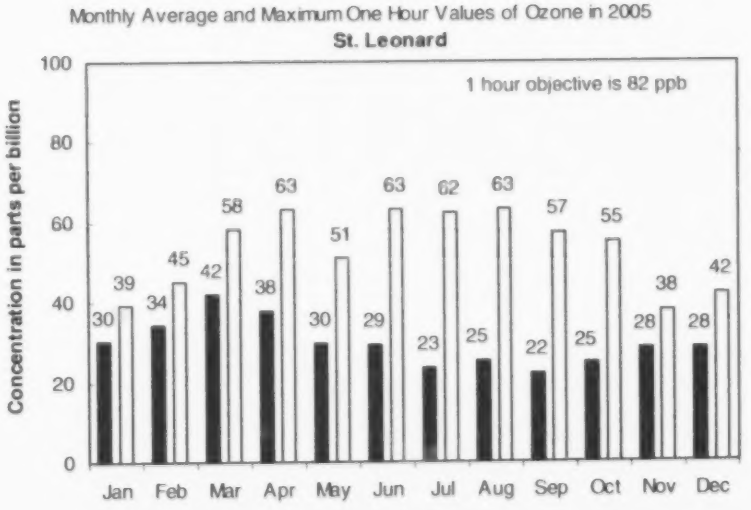
Forest Hills - Saint John

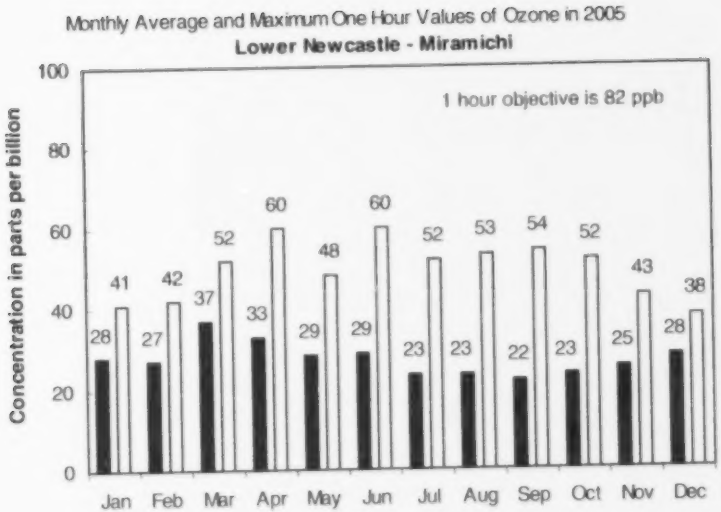

1 hour objective is 82 ppb
Concentration in parts per billion
100
80
60
40
20
0
28 38 30 43 39 50 37 65 31 57 26 62 21 47 19 56 21 51 22 54 26 51 24 39
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

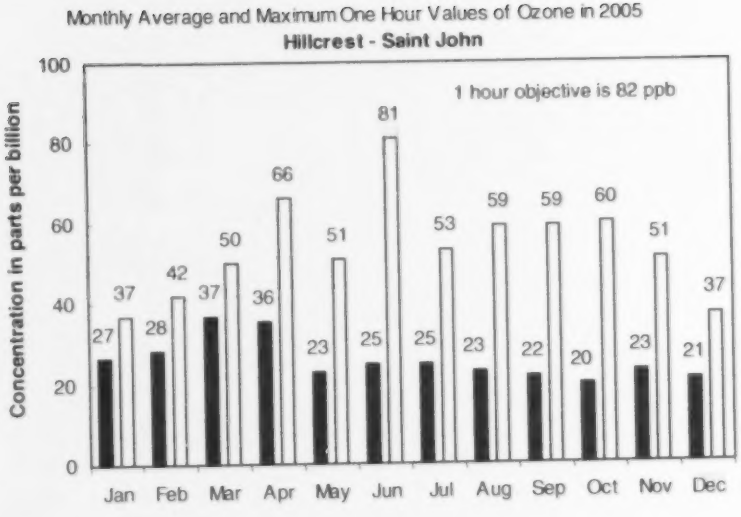

Monthly Average and Maximum One Hour Values of Ozone in 2005
Canterbury
1 hour objective is 82 ppb
Concentration in parts per billion
100
80
60
40
20
0
29 38
31 43
39 55
36 62
28 50
26 58
19 57
20 57
18 54
20 56
24 47
25 38
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

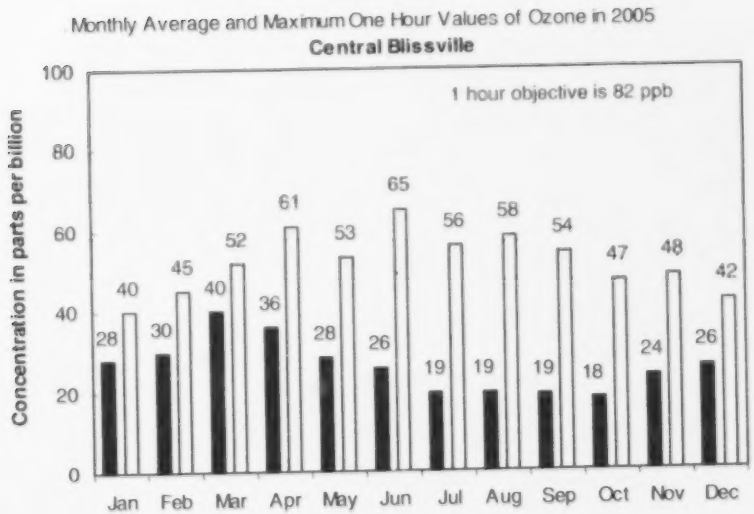

Monthly Average and Maximum One Hour Values of Ozone in 2005
Aberdeen Street - Fredericton
1 hour objective is 82 ppb
Concentration in parts per billion
100
80
60
40
20
0
27 38
25 43
36 56
34 67
30 52
27 60
21 56
21 57
19 55
20 45
22 46
23 39
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

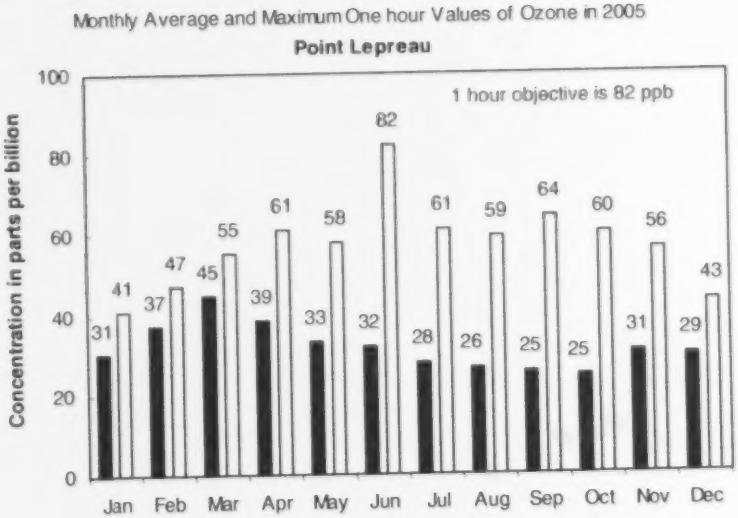

Monthly Average and Maximum One Hour Values of Ozone in 2005
Highfield Street - Moncton
1 hour objective is 82 ppb
Concentration in parts per billion
100
80
60
40
20
0
28 42
27 48
37 54
31 61
24 48
25 72
18 69
17 69
20 59
16 73
17 47
18 35
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

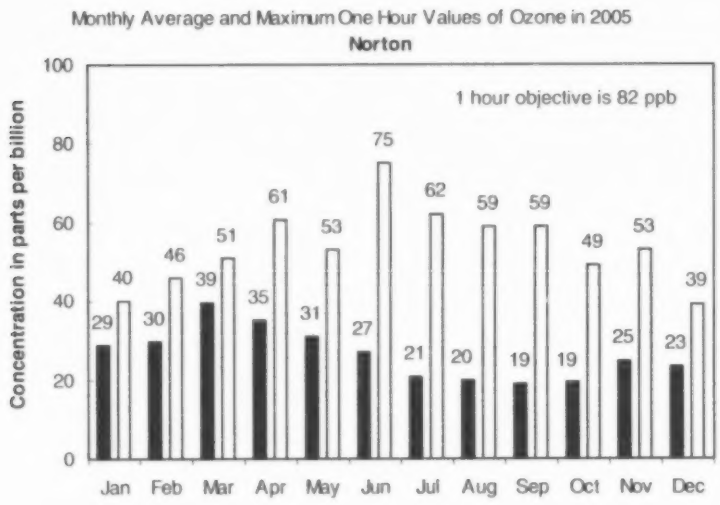

Monthly Average and Maximum One Hour Values of Ozone in 2005
St. Leonard
1 hour objective is 82 ppb
Concentration in parts per billion
100
80
60
40
20
0
30 39
34 45
42 58
38 63
30 51
29 63
23 62
25 63
22 57
25 55
28 38
28 42
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

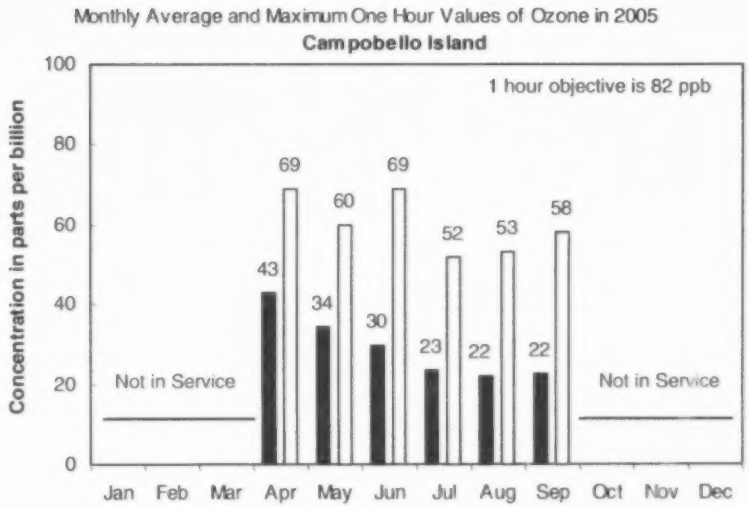

Monthly Average and Maximum One Hour Values of Ozone in 2005
Lower Newcastle - Miramichi
1 hour objective is 82 ppb
Concentration in parts per billion
0
20
40
60
80
100
Jan 28 41
Feb 27 42
Mar 37 52
Apr 33 60
May 29 48
Jun 29 60
Jul 23 52
Aug 23 53
Sep 22 54
Oct 23 52
Nov 25 43
Dec 28 38

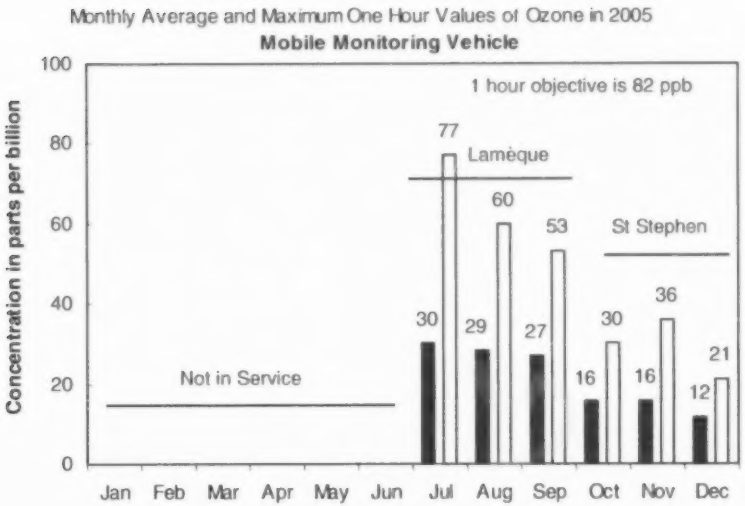

Monthly Average and Maximum One Hour Values of Ozone in 2005
Hillcrest - Saint John
1 hour objective is 82 ppb
Concentration in parts per billion
0
20
40
60
80
100
Jan 27 37
Feb 28 42
Mar 37 50
Apr 36 66
May 23 51
Jun 25 81
Jul 25 53
Aug 23 59
Sep 22 59
Oct 20 60
Nov 23 51
Dec 21 37

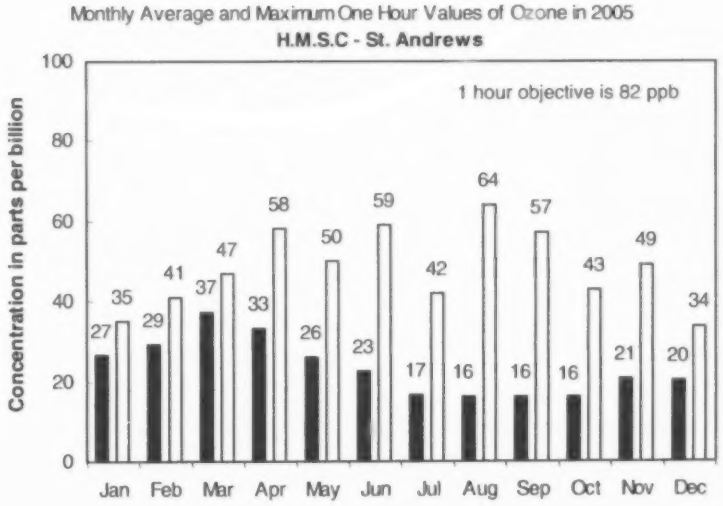

Monthly Average and Maximum One Hour Values of Ozone in 2005
Central Blissville
1 hour objective is 82 ppb
Concentration in parts per billion
0
20
40
60
80
100
Jan 28 40
Feb 30 45
Mar 40 52
Apr 36 61
May 28 53
Jun 26 65
Jul 19 56
Aug 19 58
Sep 19 54
Oct 18 47
Nov 24 48
Dec 26 42

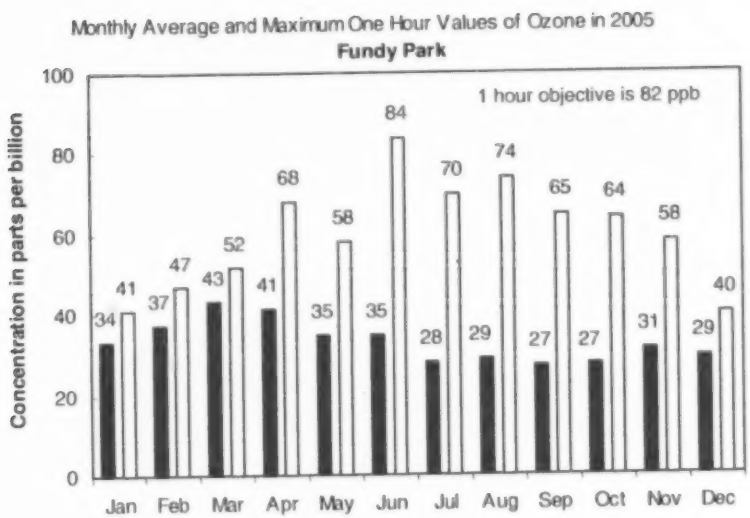

Monthly Average and Maximum One hour Values of Ozone in 2005
Point Lepreau
1 hour objective is 82 ppb
Concentration in parts per billion
0
20
40
60
80
100
Jan 31 41
Feb 37 47
Mar 45 55
Apr 39 61
May 33 58
Jun 32 82
Jul 28 61
Aug 26 59
Sep 25 64
Oct 25 60
Nov 31 56
Dec 29 43

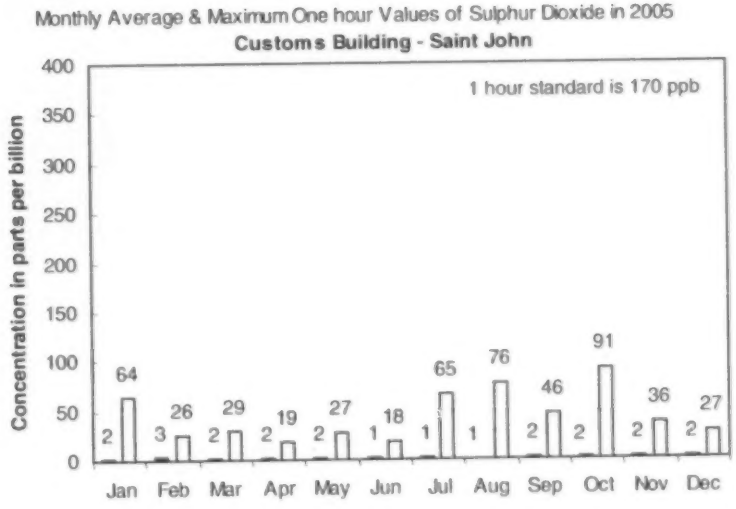

Monthly Average and Maximum One Hour Values of Ozone in 2005
Norton
1 hour objective is 82 ppb
Concentration in parts per billion
100
80
60
40
20
0
29 40
30 46
39 51
35 61
31 53
27 75
21 62
20 59
19 59
19
25 49
23 53
39
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

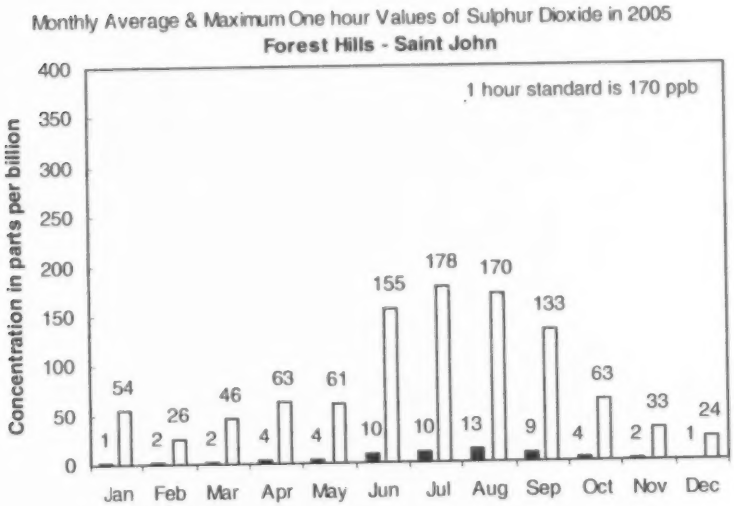

Monthly Average and Maximum One Hour Values of Ozone in 2005
Campobello Island
1 hour objective is 82 ppb
Concentration in parts per billion
100
80
60
40
20
0
Not in Service
43 69
34 60
30 69
23 52
22 53
22 58
Not in Service
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

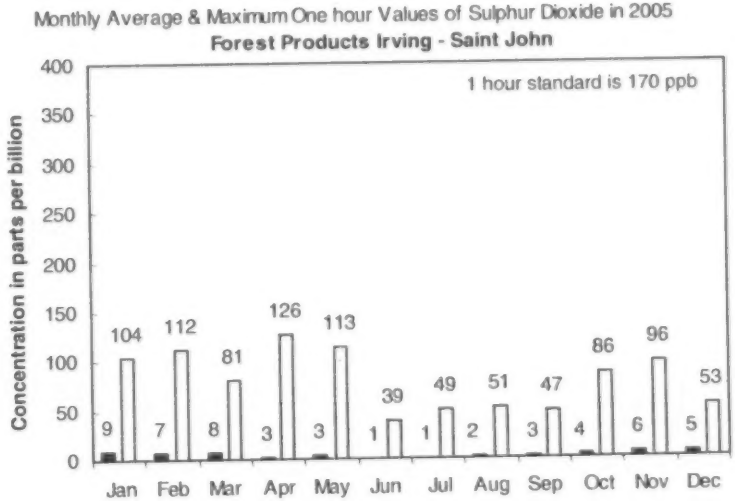

Monthly Average and Maximum One Hour Values of Ozone in 2005
Mobile Monitoring Vehicle
1 hour objective is 82 ppb
Concentration in parts per billion
100
80
60
40
20
0
Not in Service
Lamèque
St Stephen
30 77
29 60
27 53
16 30
16 36
12 21
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average and Maximum One Hour Values of Ozone in 2005
H.M.S.C - St. Andrews
1 hour objective is 82 ppb
Concentration in parts per billion
100
80
60
40
20
0
27 35
29 41
37 47
33 58
26 50
23 59
17 42
16 64
16 57
16 43
21 49
20 34
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average and Maximum One Hour Values of Ozone in 2005
Fundy Park
1 hour objective is 82 ppb
Concentration in parts per billion
0
20
40
60
80
100
34 41
37 47
43 52
41 68
35 58
35 84
28 70
29 74
27 65
27 64
31 58
29 40
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

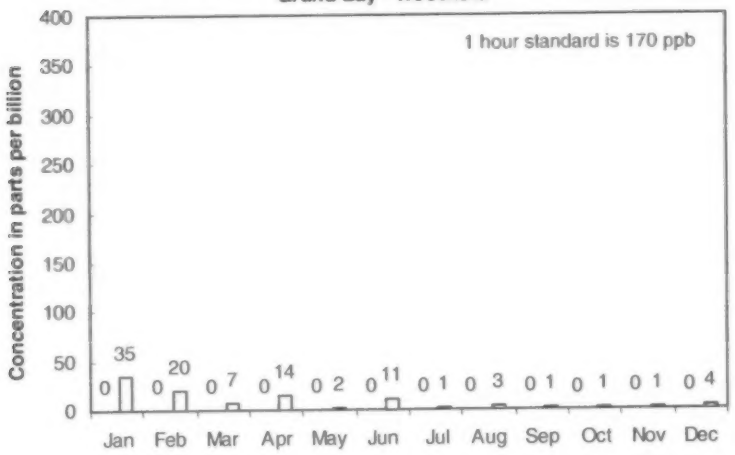

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005
Customs Building - Saint John
1 hour standard is 170 ppb
Concentration in parts per billion
0
50
100
150
200
250
300
350
400
2 64
3 26
2 29
2 19
2 27
1 18
1 65
1 76
2 46
2 91
2 36
2 27
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005
Forest Hills - Saint John
1 hour standard is 170 ppb
Concentration in parts per billion
0
50
100
150
200
250
300
350
400
1 54
2 26
2 46
4 63
4 61
10 155
10 178
13 170
9 133
4 63
2 33
1 24
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005
Forest Products Irving - Saint John
1 hour standard is 170 ppb
Concentration in parts per billion
0
50
100
150
200
250
300
350
400
9 104
7 112
8 81
3 126
3 113
1 39
1 49
2 51
3 47
4 86
6 96
5 53
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

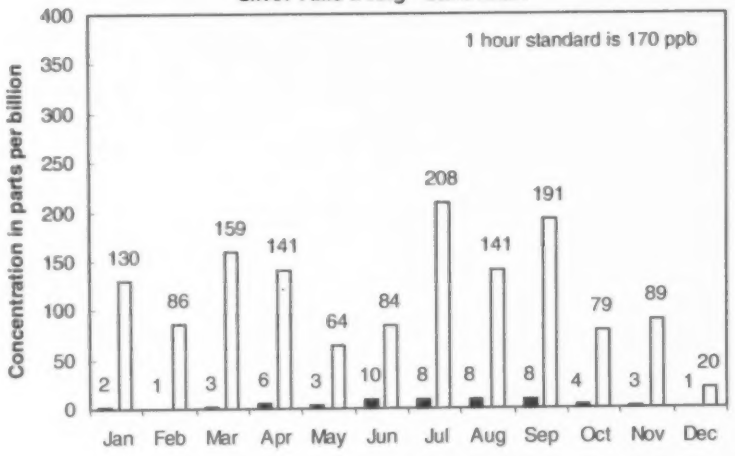
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

Grand Bay - Westfield


Concentration in parts per billion
1 hour standard is 170 ppb
0 35 0 20 0 7 0 14 0 2 0 11 0 1 0 3 0 1 0 1 0 1 0 4
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

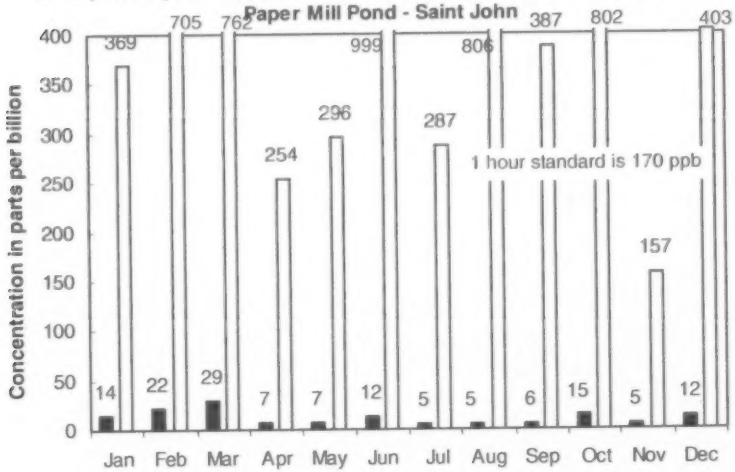
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

Silver Falls Irving - Saint John


Concentration in parts per billion
1 hour standard is 170 ppb
2 130 1 86 3 159 6 141 3 64 10 84 8 208 8 141 8 191 4 79 3 89 1 20
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

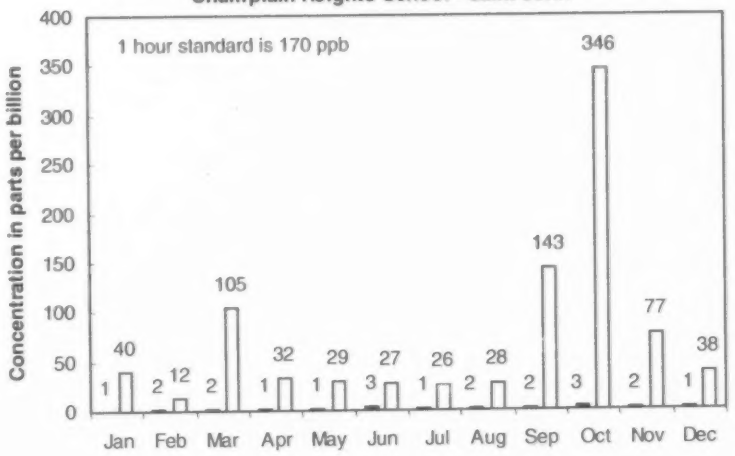
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

Paper Mill Pond - Saint John


Concentration in parts per billion
1 hour standard is 170 ppb
14 369 22 705 29 762 7 254 7 296 12 999 5 287 5 806 6 387 15 802 5 157 12 403
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

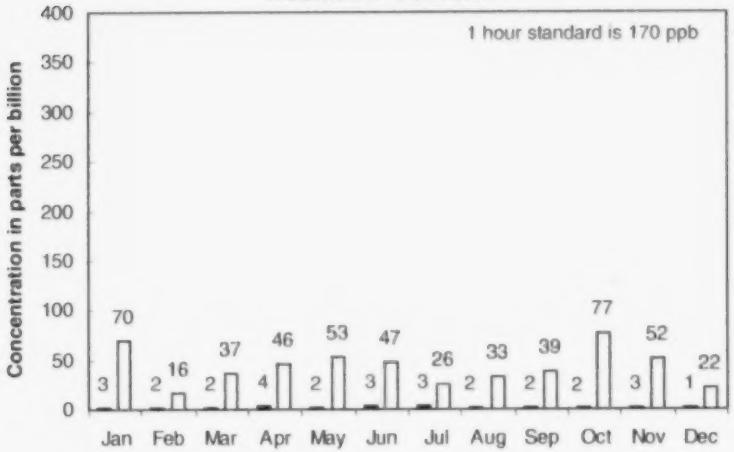
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

Champlain Heights School - Saint John


Concentration in parts per billion
1 hour standard is 170 ppb
1 40 2 12 2 105 1 32 1 29 3 27 1 26 2 28 2 143 3 346 2 77 1 38
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

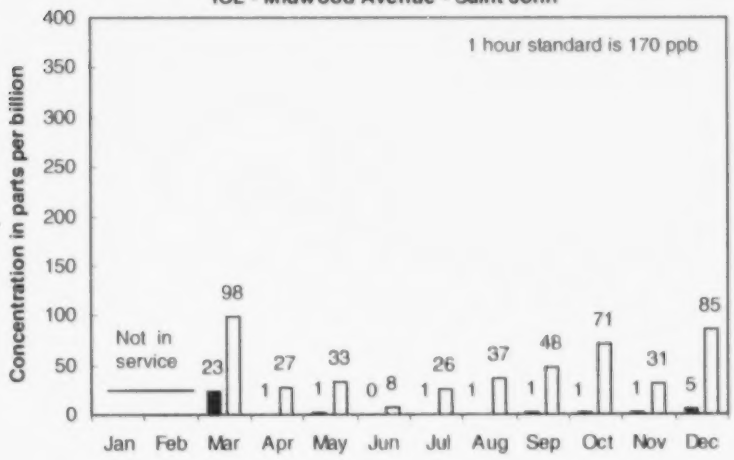
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

Indiantown - Saint John


1 hour standard is 170 ppb
Concentration in parts per billion
400
350
300
250
200
150
100
50
0
3 70 2 16 2 37 4 46 2 53 3 47 3 26 2 33 2 39 2 77 3 52 1 22
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

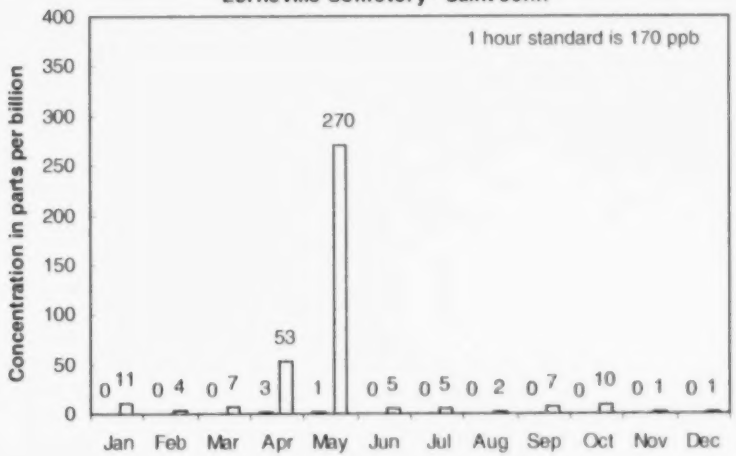
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

IOL - Midwood Avenue - Saint John



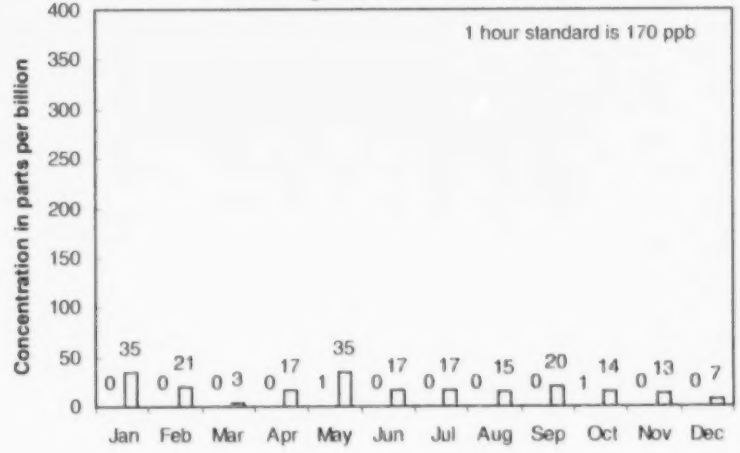
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

Lorneville Cemetery - Saint John


1 hour standard is 170 ppb
Concentration in parts per billion
400
350
300
250
200
150
100
50
0
0 11 0 4 0 7 3 53 1 270 0 5 0 5 0 2 0 7 0 10 0 1 0 1
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

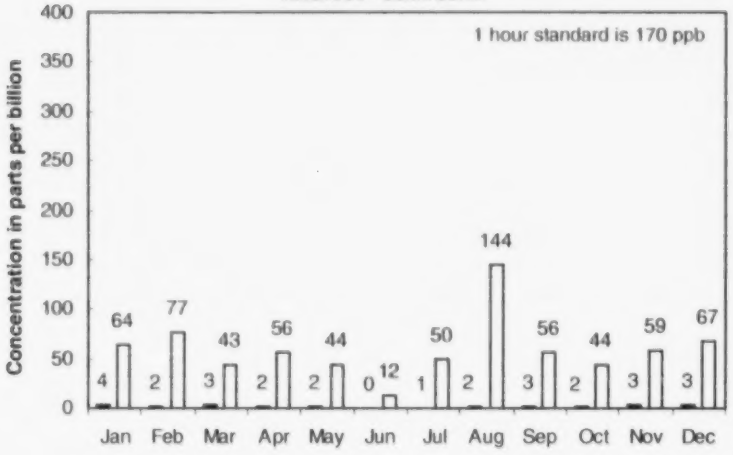
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

Manawagonish Road - Saint John


1 hour standard is 170 ppb
Concentration in parts per billion
400
350
300
250
200
150
100
50
0
0 35 0 21 0 3 0 17 1 35 0 17 0 17 0 15 0 20 1 14 0 13 0 7
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

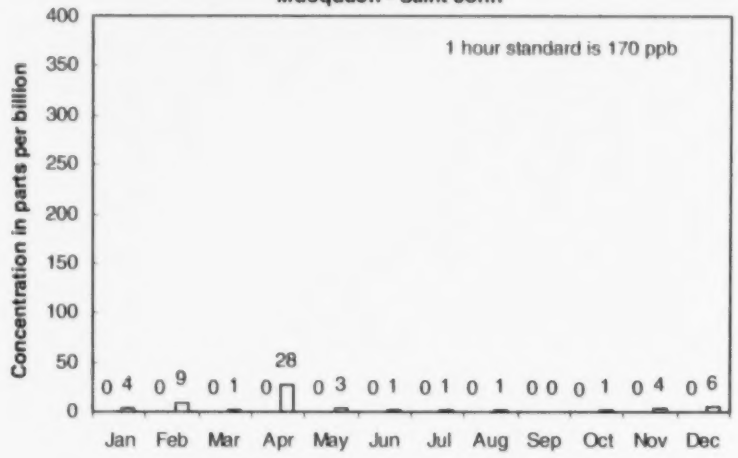
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

Hillcrest - Saint John



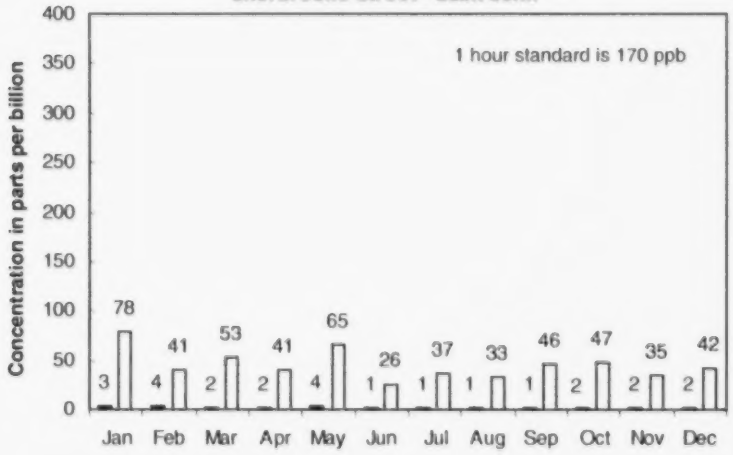
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

Musquash - Saint John



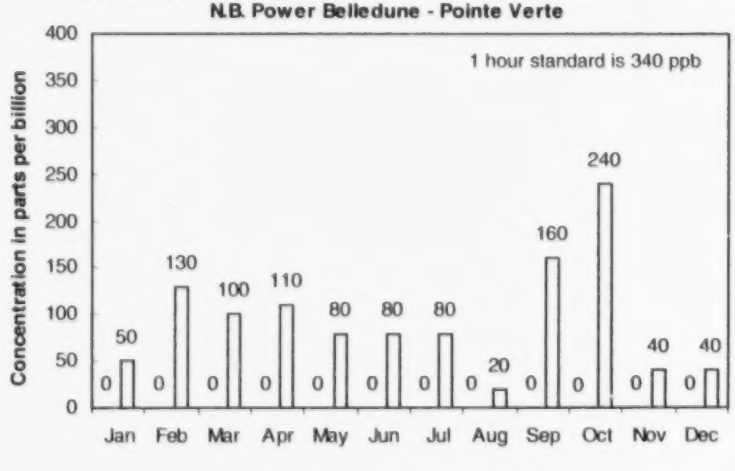
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

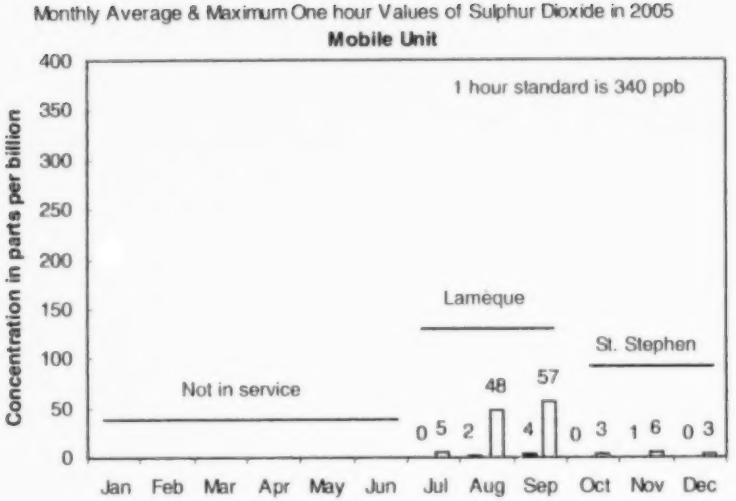
Sherbrooke Street - Saint John

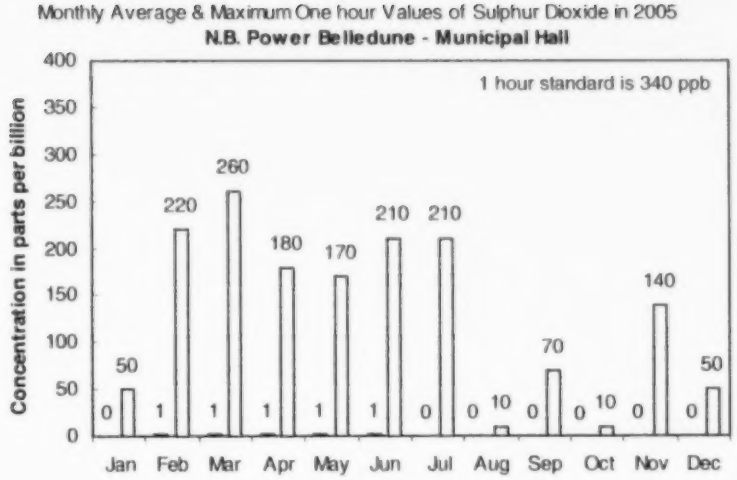


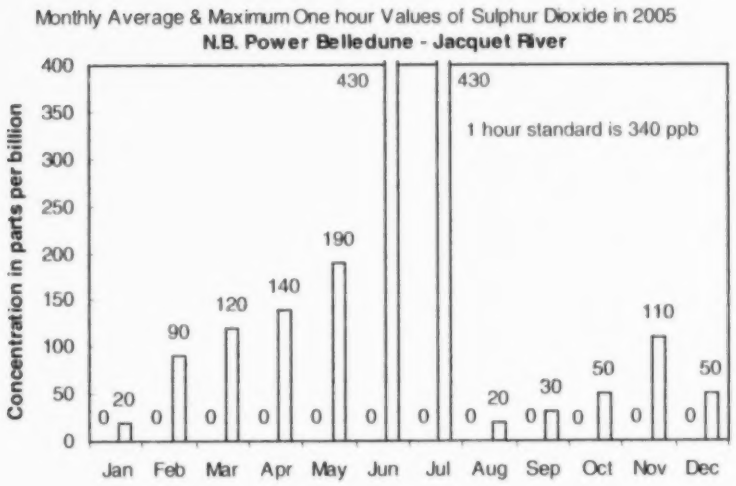
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

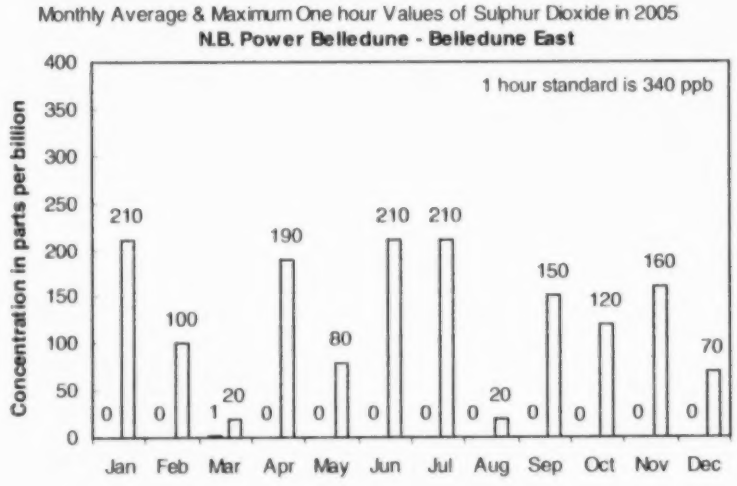
N.B. Power Belledune - Pointe Verte




Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005
Mobile Unit
1 hour standard is 340 ppb
Concentration in parts per billion
Not in service
Lameque
St. Stephen
0 5 2 48 4 57 0 3 1 6 0 3
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

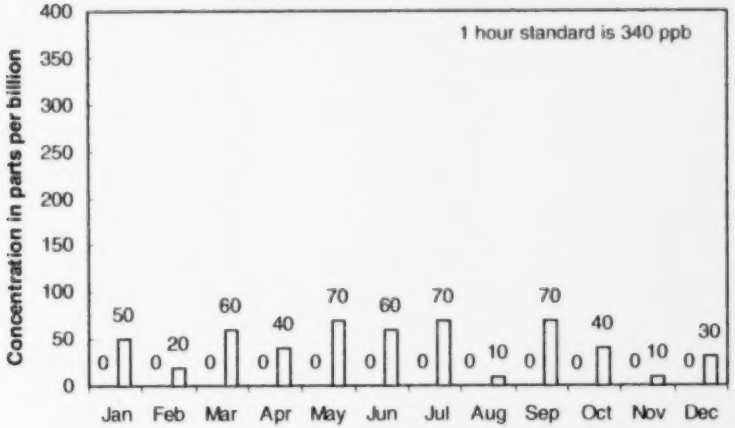

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005
N.B. Power Belledune - Municipal Hall
1 hour standard is 340 ppb
Concentration in parts per billion
0 50 1 220 1 260 1 180 1 170 1 210 0 210 0 10 0 70 0 10 0 140 0 50
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005
N.B. Power Belledune - Jacquet River
1 hour standard is 340 ppb
Concentration in parts per billion
0 20 0 90 0 120 0 140 0 190 0 430 0 430 0 20 0 30 0 50 0 110 0 50
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005
N.B. Power Belledune - Belledune East
1 hour standard is 340 ppb
Concentration in parts per billion
0 210 0 100 1 20 0 190 0 80 0 210 0 210 0 20 0 150 0 120 0 160 0 70
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

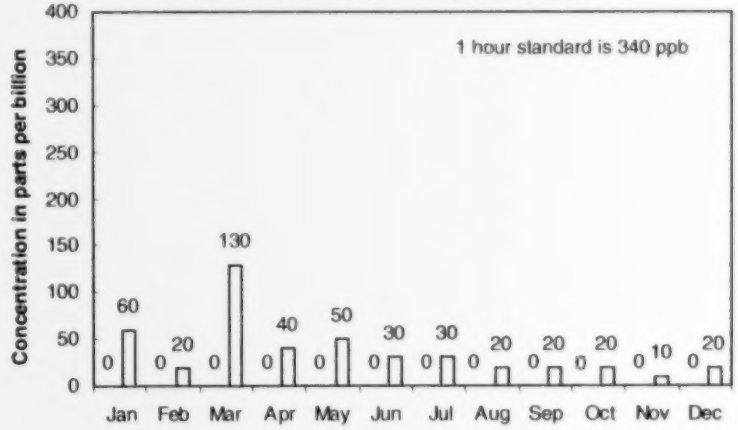
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

N.B. Power Belledune - Madran



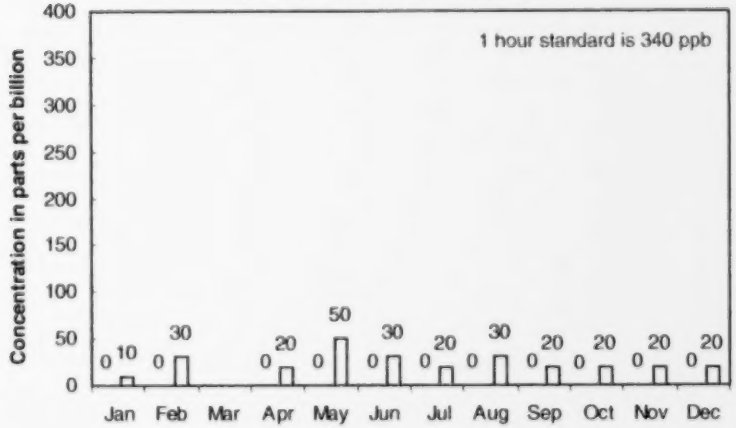
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

N.B. Power Dalhousie - Dalhousie Tower



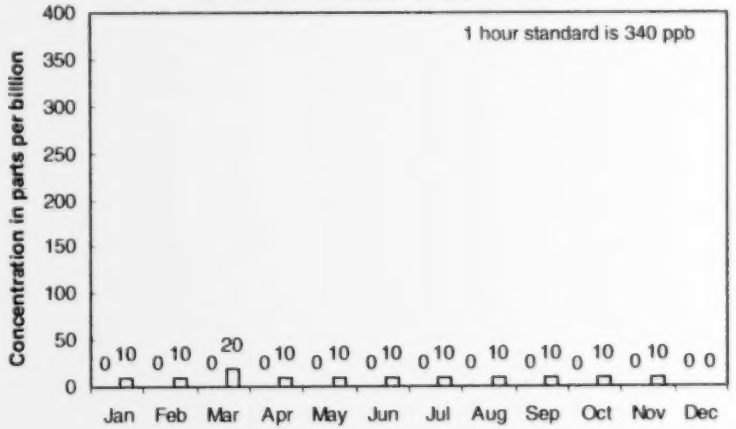
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

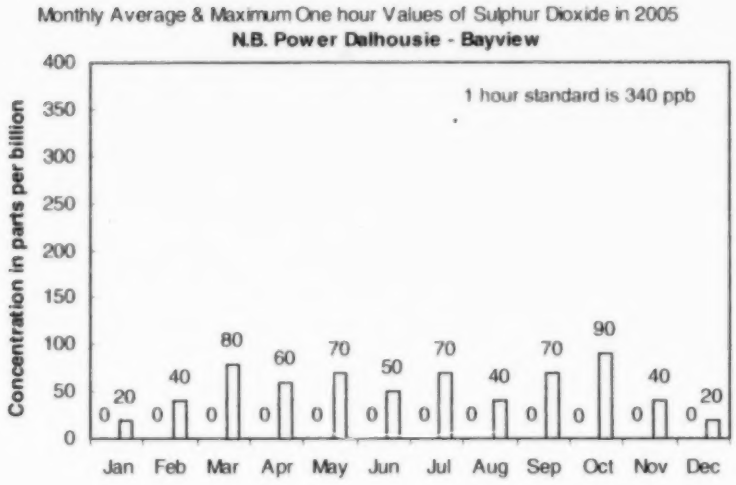
N.B. Power Dalhousie - Charlo

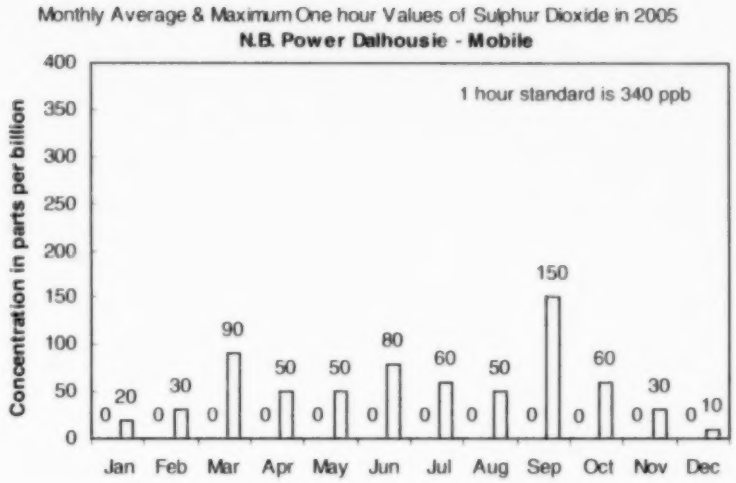


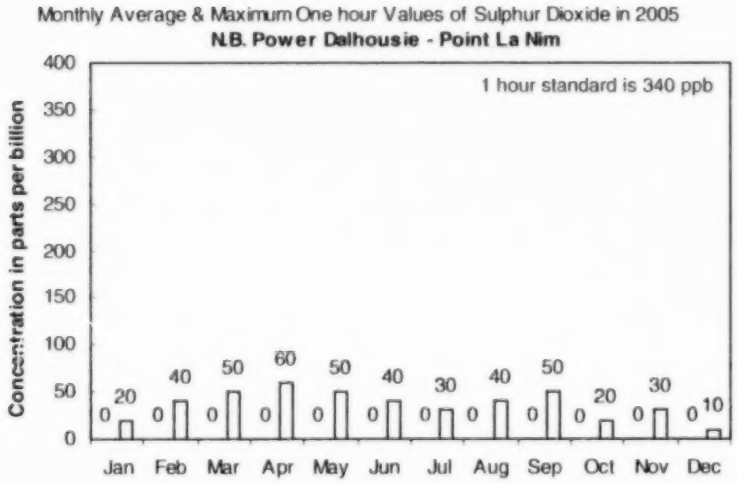
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

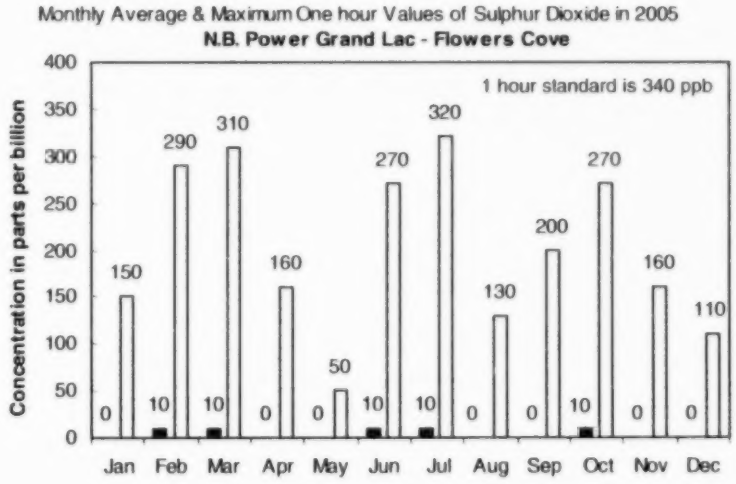
N.B. Power Dalhousie - Pointe à la Garde




Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005
N.B. Power Dalhousie - Bayview
1 hour standard is 340 ppb
Concentration in parts per billion
400
350
300
250
200
150
100
50
0
0 20 0 40 0 80 0 60 0 70 0 50 0 70 0 40 0 70 0 90 0 40 0 20
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

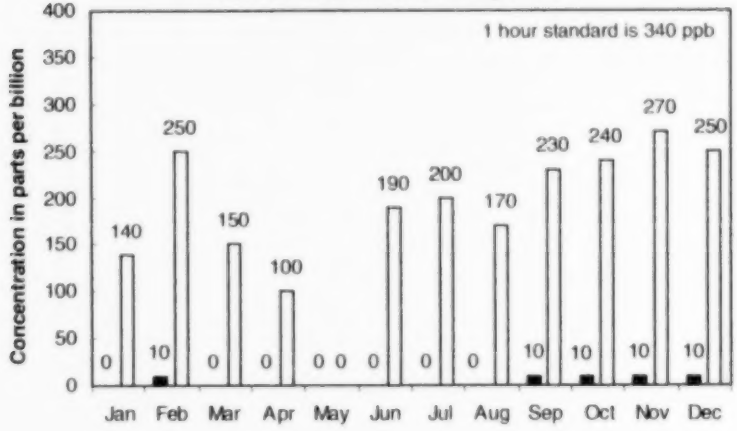

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005
N.B. Power Dalhousie - Mobile
1 hour standard is 340 ppb
Concentration in parts per billion
400
350
300
250
200
150
100
50
0
0 20 0 30 0 90 0 50 0 50 0 80 0 60 0 50 0 150 0 60 0 30 0 10
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005
N.B. Power Dalhousie - Point La Nim
1 hour standard is 340 ppb
Concentration in parts per billion
400
350
300
250
200
150
100
50
0
0 20 0 40 0 50 0 60 0 50 0 40 0 30 0 40 0 50 0 20 0 30 0 10
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005
N.B. Power Grand Lac - Flowers Cove
1 hour standard is 340 ppb
Concentration in parts per billion
400
350
300
250
200
150
100
50
0
0 150 10 290 10 310 0 160 0 50 10 270 10 320 0 130 0 200 10 270 0 160 0 110
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

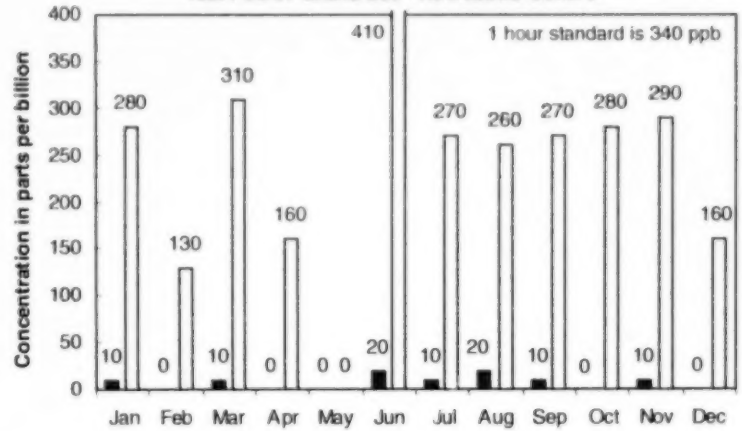
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

N.B. Power Grand Lac - Bailey Point


1 hour standard is 340 ppb
Concentration in parts per billion
0 50 100 150 200 250 300 350 400
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
0 140 10 250 0 150 0 100 0 0 0 190 0 200 0 170 10 230 10 240 10 270 10 250

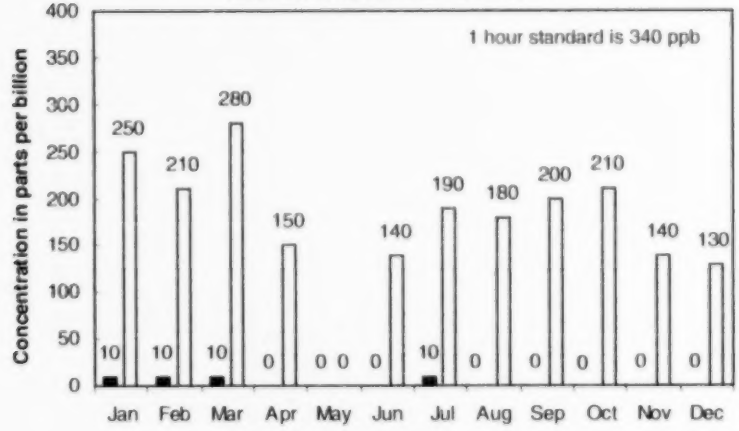
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

N.B. Power Grand Lac - Newcastle Centre


1 hour standard is 340 ppb
Concentration in parts per billion
0 50 100 150 200 250 300 350 400
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
10 280 0 130 10 310 0 160 0 0 20 410 10 270 20 260 10 270 0 280 10 290 0 160

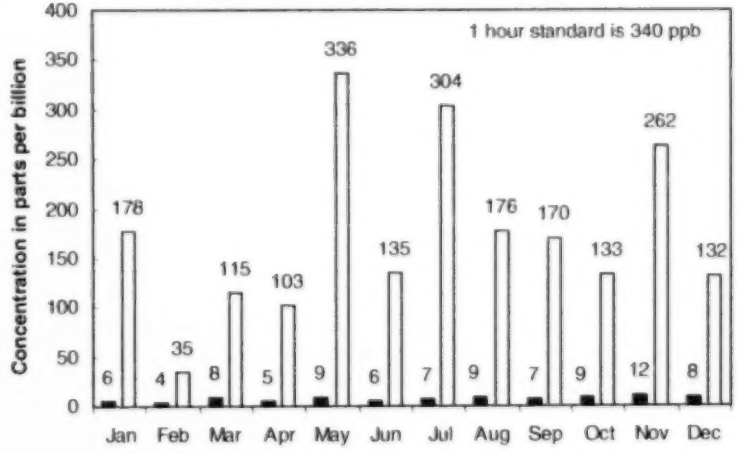
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

N.B. Power Grand Lac - Cox Point


1 hour standard is 340 ppb
Concentration in parts per billion
0 50 100 150 200 250 300 350 400
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
10 250 10 210 10 280 0 150 0 0 0 140 10 190 0 180 0 200 0 210 0 140 0 130

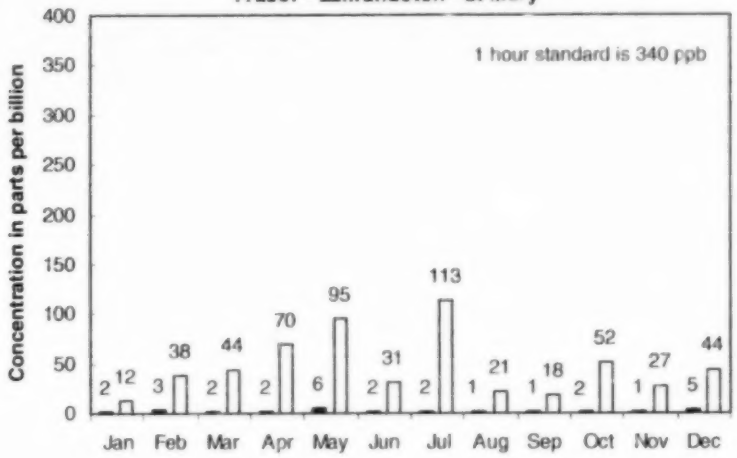
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

Fraser - Edmundston - Cormier School


1 hour standard is 340 ppb
Concentration in parts per billion
0 50 100 150 200 250 300 350 400
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
6 178 4 35 8 115 5 103 9 336 6 135 7 304 9 176 7 170 9 133 12 262 8 132

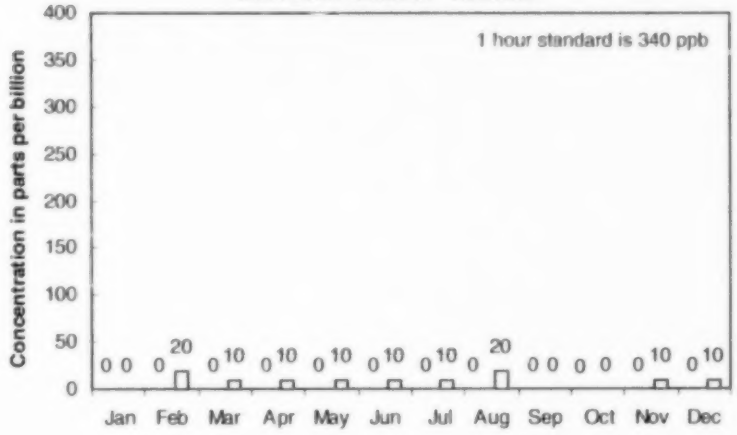
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

Fraser - Edmundston - St Mary


1 hour standard is 340 ppb
Concentration in parts per billion
400
350
300
250
200
150
100
50
0
2 12 3 38 2 44 2 70 6 95 2 31 2 113 1 21 1 18 2 52 1 27 5 44
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

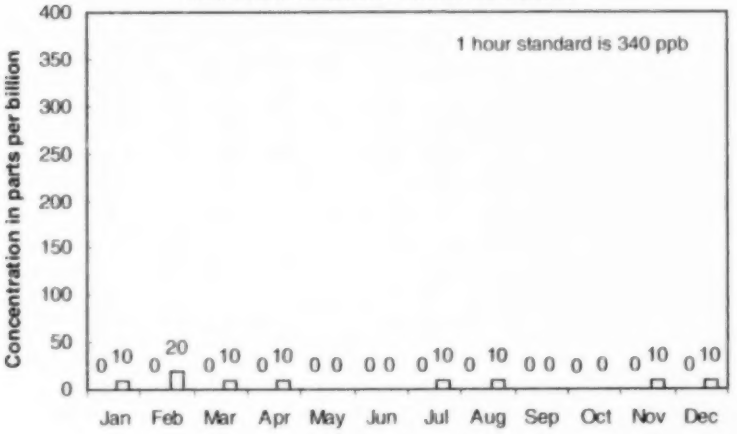
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

N.B. Power Millbank - Rockcliff


1 hour standard is 340 ppb
Concentration in parts per billion
400
350
300
250
200
150
100
50
0
0 0 0 20 0 10 0 10 0 10 0 10 0 10 0 10 0 20 0 0 0 0 0 10 0 10
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

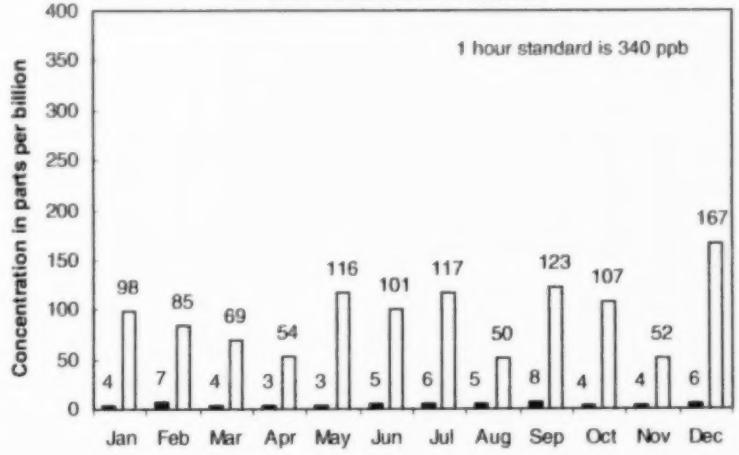
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

N.B. Power Millbank - Lower Newcastle


1 hour standard is 340 ppb
Concentration in parts per billion
400
350
300
250
200
150
100
50
0
0 10 0 20 0 10 0 10 0 0 0 0 0 10 0 10 0 0 0 0 0 10 0 10
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

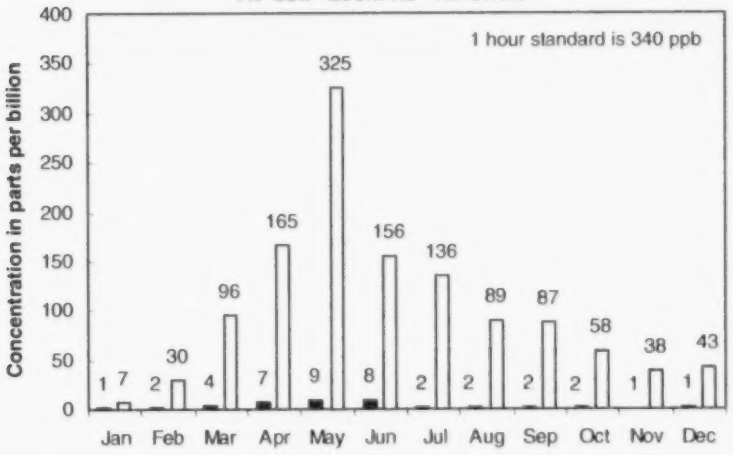
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

AV Cell - Beauvista E - Atholville


1 hour standard is 340 ppb
Concentration in parts per billion
400
350
300
250
200
150
100
50
0
4 98 7 85 4 69 3 54 3 116 5 101 6 117 5 50 8 123 4 107 4 52 6 167
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

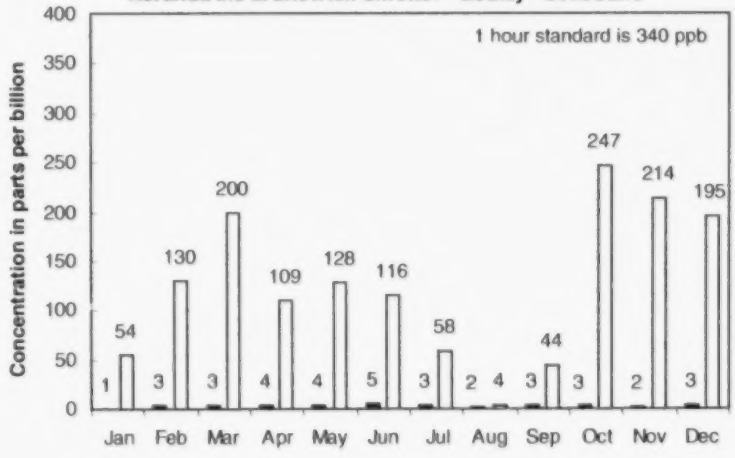
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

AV Cell - Boom Rd - Atholville


Concentration in parts per billion
1 hour standard is 340 ppb
0
50
100
150
200
250
300
350
400
1 7 2 30 4 96 7 165 9 325 8 156 2 136 2 89 2 87 2 58 1 38 1 43
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

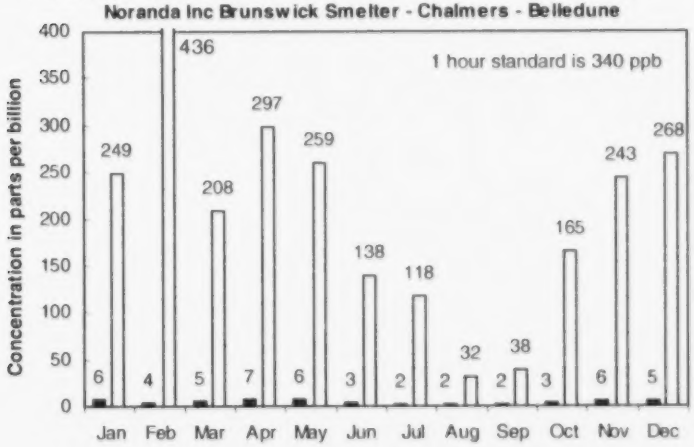
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

Noranda Inc Brunswick Smelter - Boulay - Belledune


Concentration in parts per billion
1 hour standard is 340 ppb
0
50
100
150
200
250
300
350
400
1 54 3 130 3 200 4 109 4 128 5 116 3 58 2 4 3 44 3 247 2 214 3 195
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

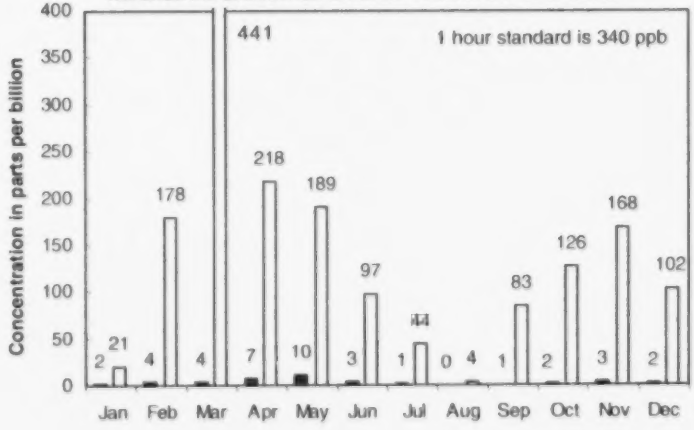
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

Noranda Inc Brunswick Smelter - Chalmers - Belledune


Concentration in parts per billion
1 hour standard is 340 ppb
0
50
100
150
200
250
300
350
400
6 249 4 436 5 208 7 297 6 259 3 138 2 118 2 32 2 38 3 165 6 243 5 268
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

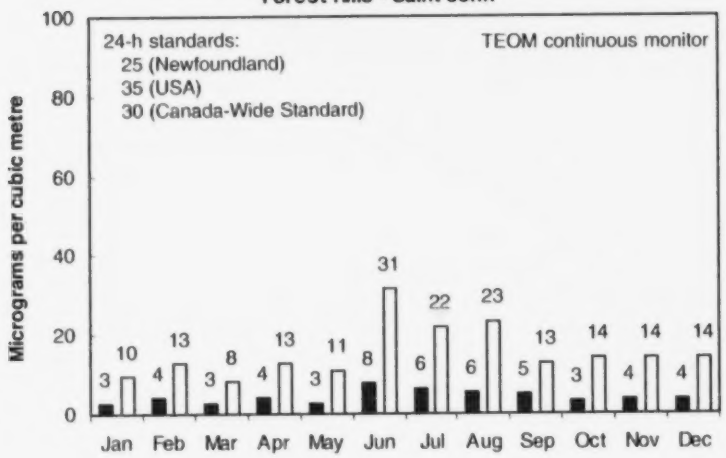
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2005

Noranda Inc Brunswick Smelter - Townsite - Belledune


Concentration in parts per billion
1 hour standard is 340 ppb
0
50
100
150
200
250
300
350
400
2 21 4 178 4 441 7 218 10 189 3 97 1 44 0 4 1 83 2 126 3 168 2 102
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

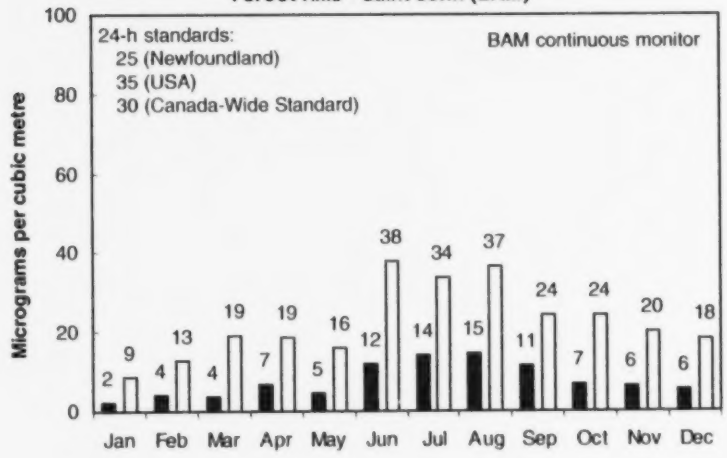
Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2005

Forest Hills - Saint John



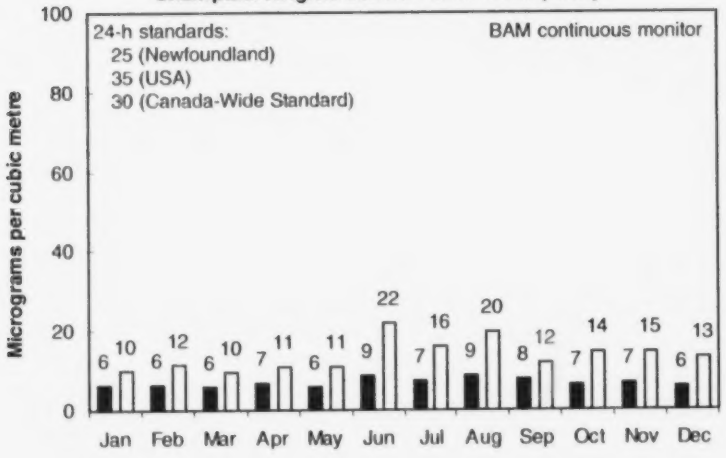
Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2005

Forest Hills - Saint John (BAM)



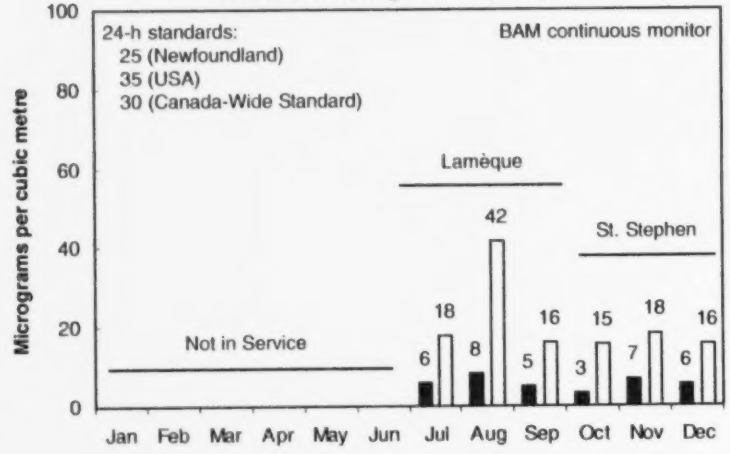
Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2005

Champlain Heights School - Saint John (BAM)



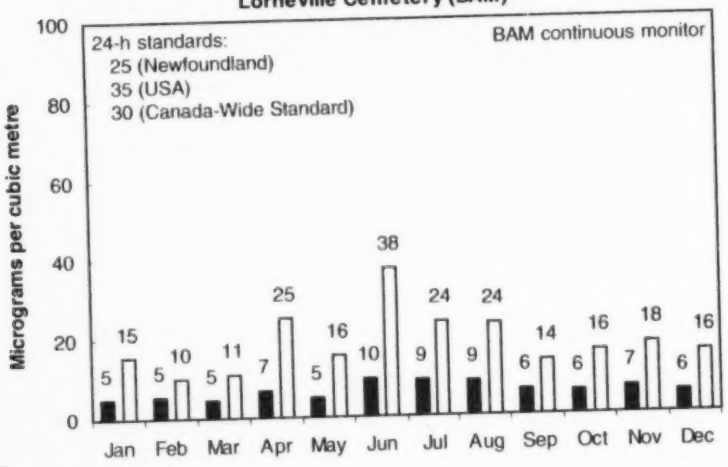
Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2005

Mobile Monitoring Vehicle (BAM)



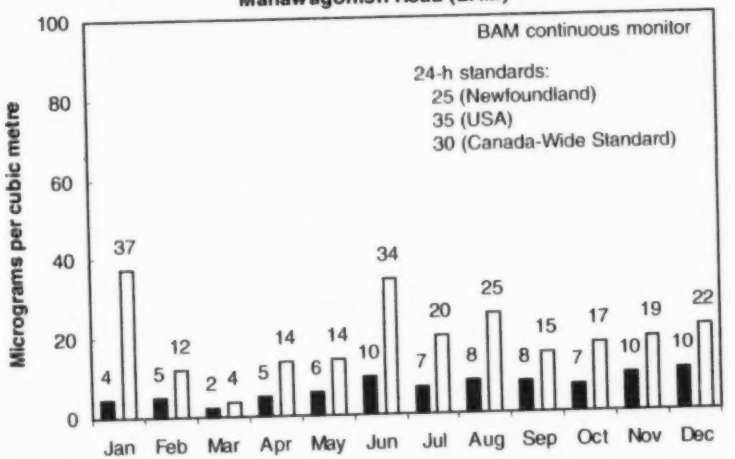
Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2005

Lorneville Cemetery (BAM)



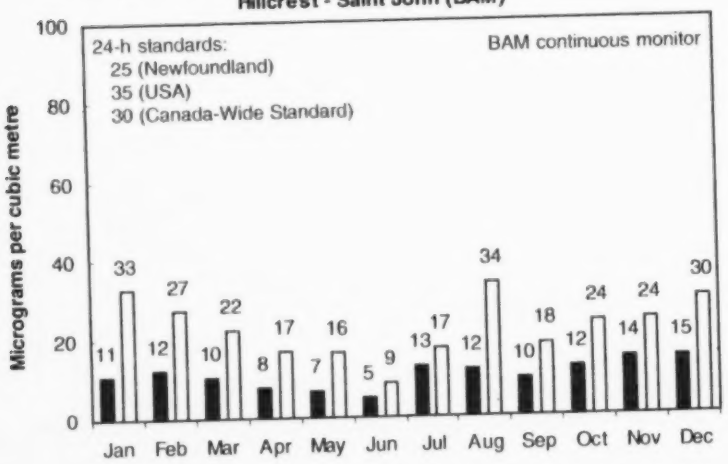
Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2005

Manawagonish Road (BAM)



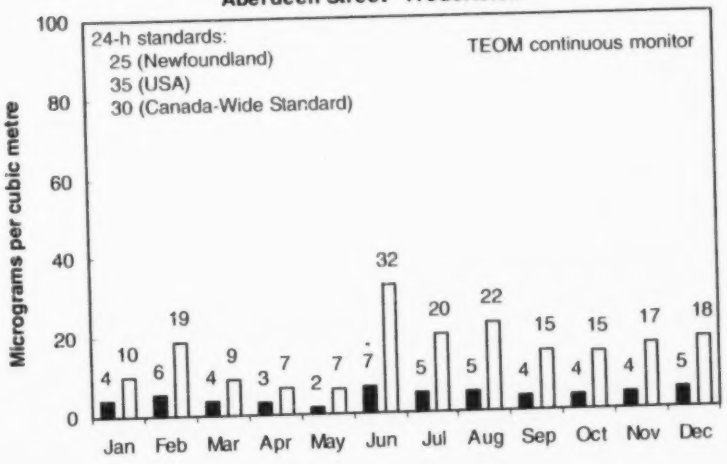
Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2005

Hillcrest - Saint John (BAM)



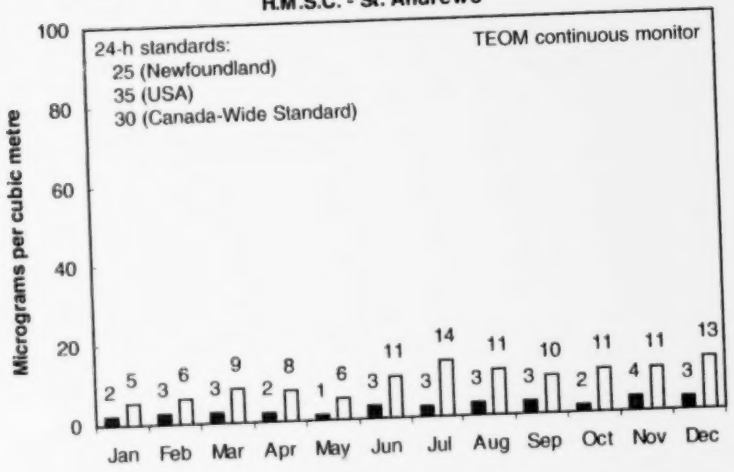
Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2005

Aberdeen Street - Fredericton



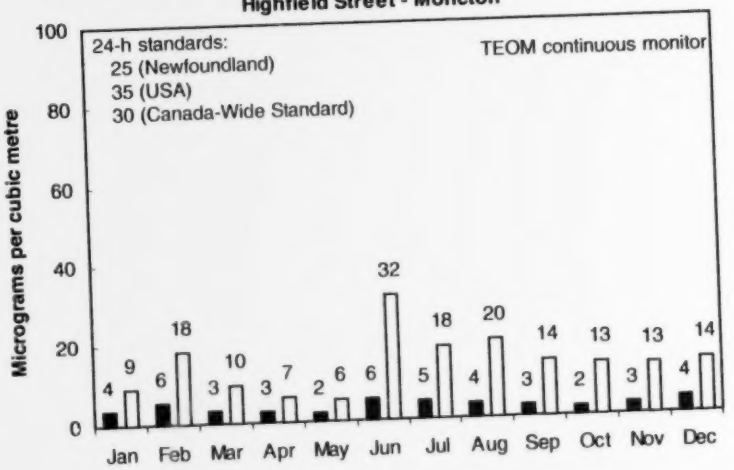
Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2005

H.M.S.C. - St. Andrews


Micrograms per cubic metre
100
80
60
40
20
0
24-h standards:
25 (Newfoundland)
35 (USA)
30 (Canada-Wide Standard)
TEOM continuous monitor
2 5 3 6 3 9 2 8 1 6 3 11 3 14 3 11 3 10 2 11 4 11 3 13
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

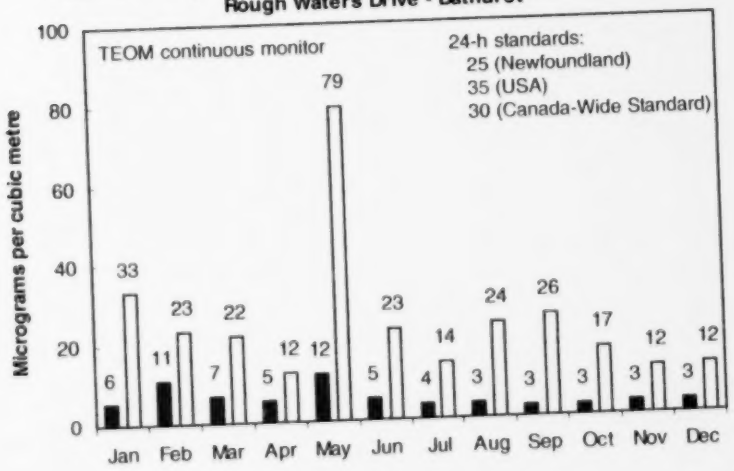
Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2005

Highfield Street - Moncton


Micrograms per cubic metre
100
80
60
40
20
0
24-h standards:
25 (Newfoundland)
35 (USA)
30 (Canada-Wide Standard)
TEOM continuous monitor
4 9 6 18 3 10 3 7 2 6 6 32 5 18 4 20 3 14 2 13 3 13 4 14
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

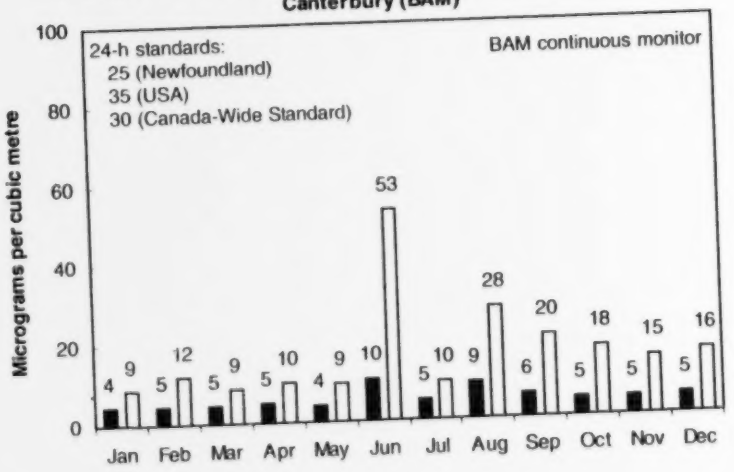
Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2005

Rough Waters Drive - Bathurst


Micrograms per cubic metre
100
80
60
40
20
0
TEOM continuous monitor
24-h standards:
25 (Newfoundland)
35 (USA)
30 (Canada-Wide Standard)
6 33 11 23 7 22 5 12 12 79 5 23 4 14 3 24 3 26 3 17 3 12 3 12
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

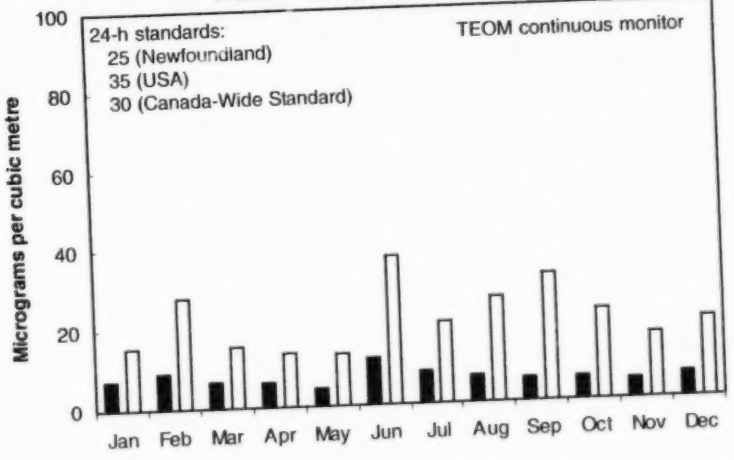
Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2005

Canterbury (BAM)


Micrograms per cubic metre
100
80
60
40
20
0
24-h standards:
25 (Newfoundland)
35 (USA)
30 (Canada-Wide Standard)
BAM continuous monitor
4 9 5 12 5 9 5 10 4 9 10 53 5 10 9 28 6 20 5 18 5 15 5 16
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

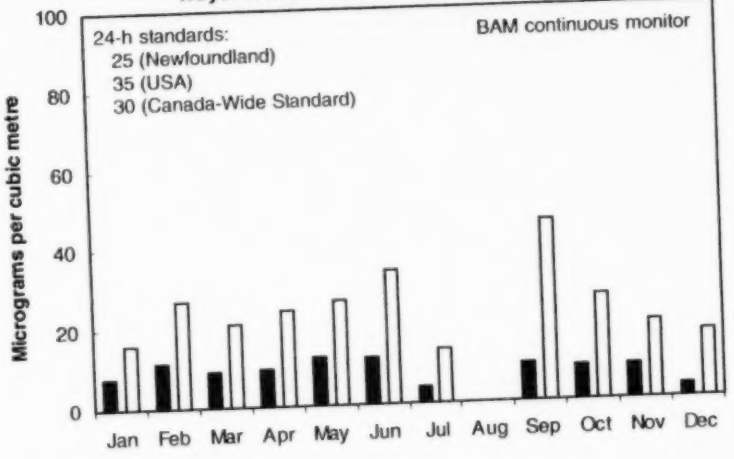
Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2005

Fraser - Edmundston - Cormier



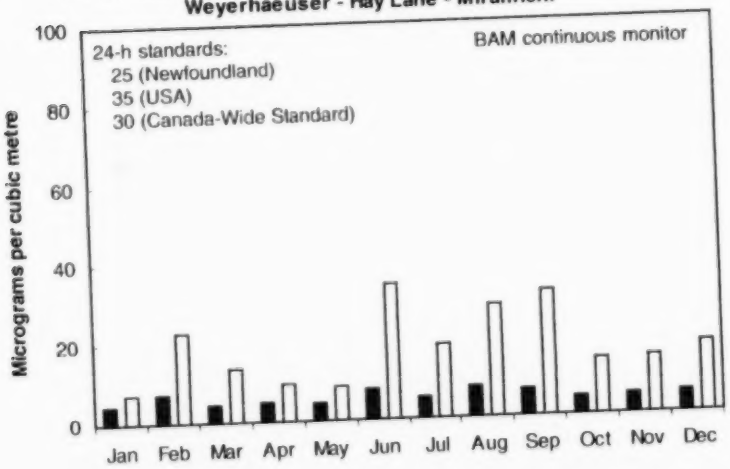
Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2005

Weyerhaeuser - Fire Ponds - Miramichi



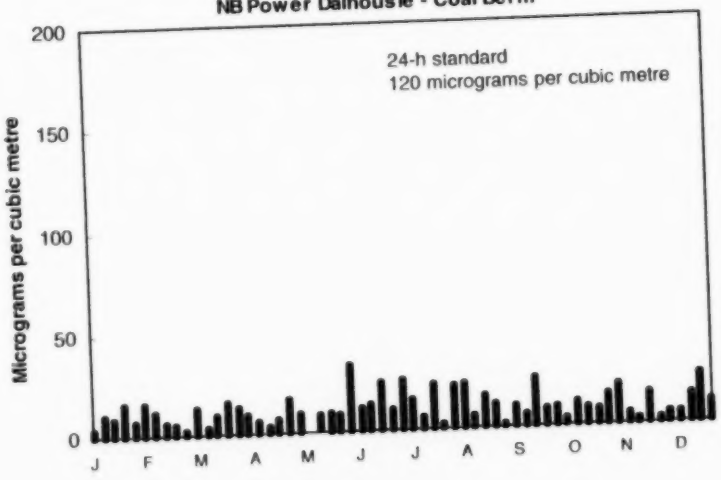
Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2005

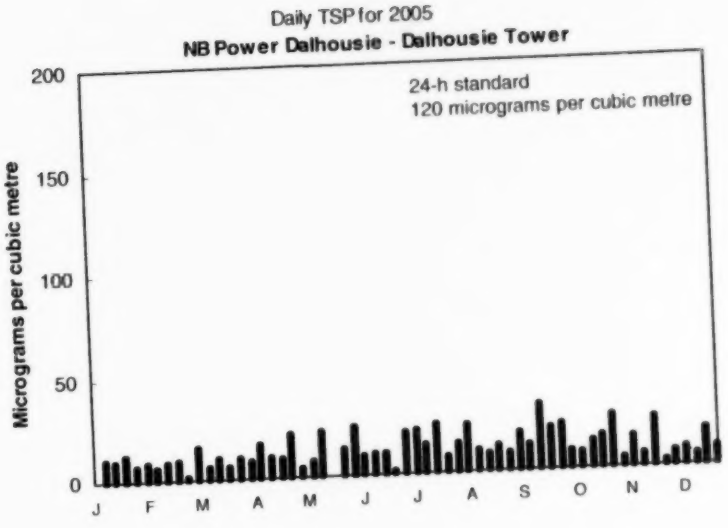
Weyerhaeuser - Hay Lane - Miramichi

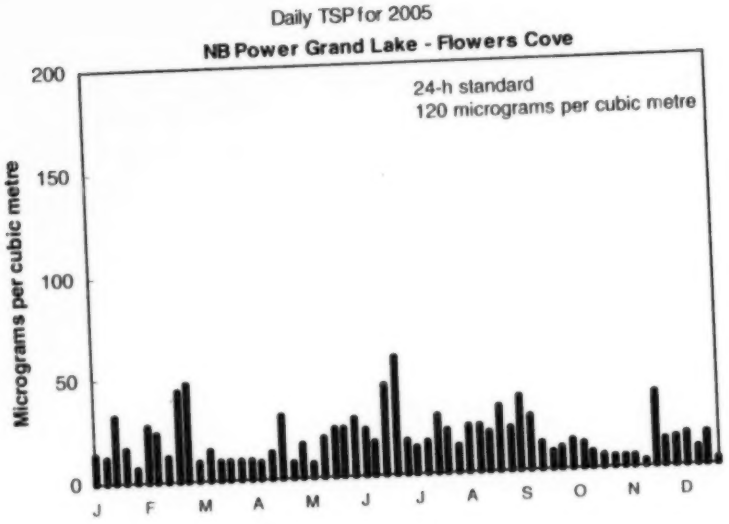


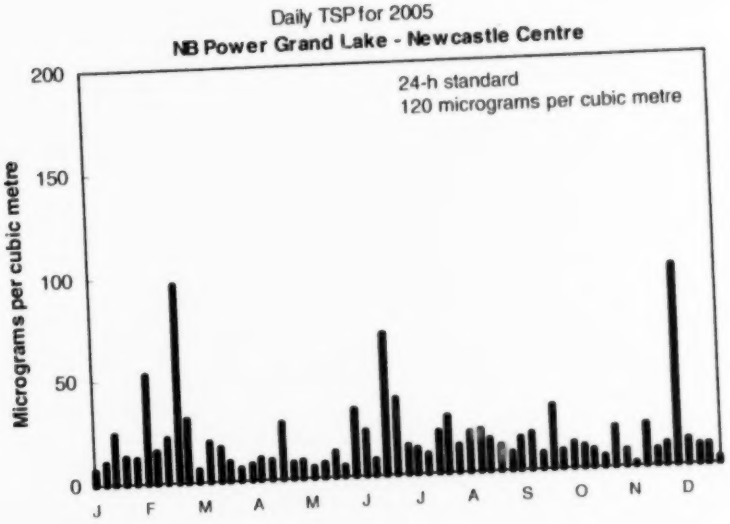
Daily TSP for 2005

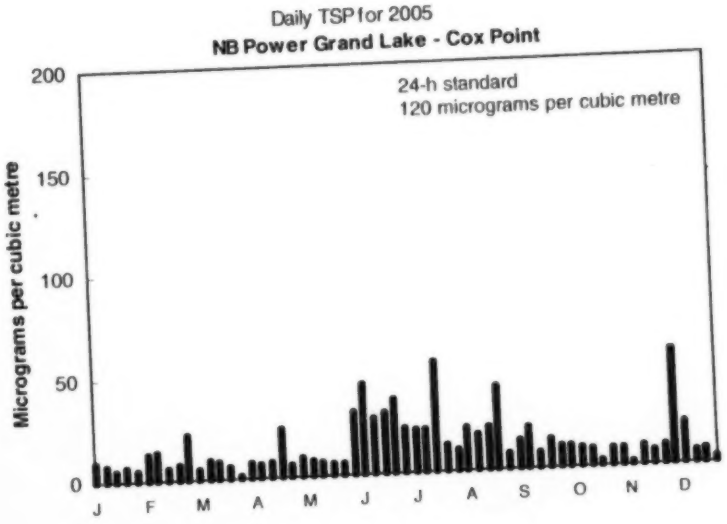
NB Power Dalhousie - Coal Berm

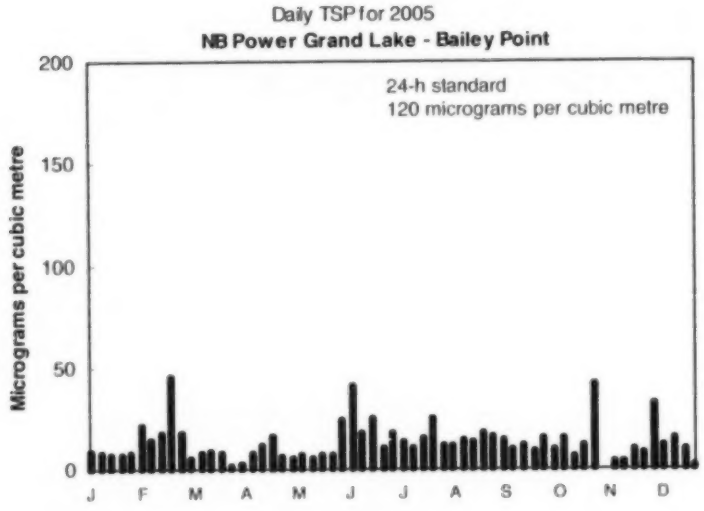


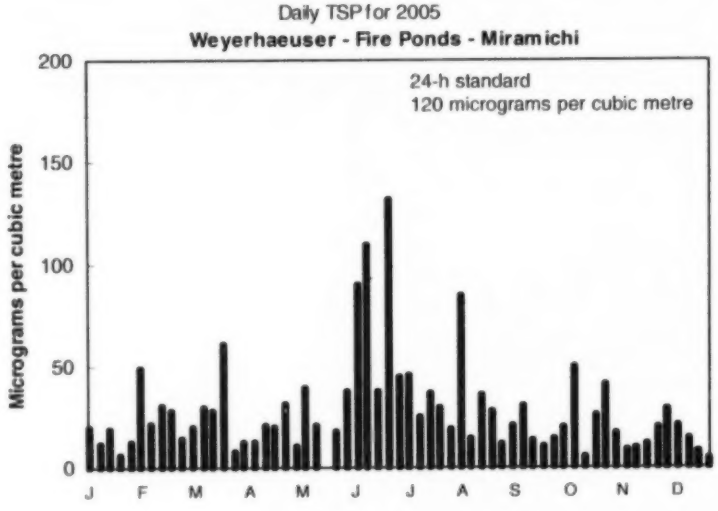

Daily TSP for 2005
NB Power Dalhousie - Dalhousie Tower
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D

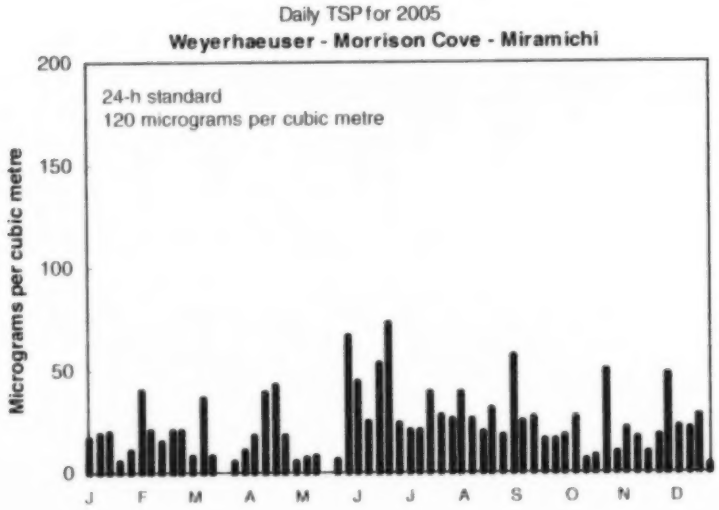

Daily TSP for 2005
NB Power Grand Lake - Flowers Cove
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D

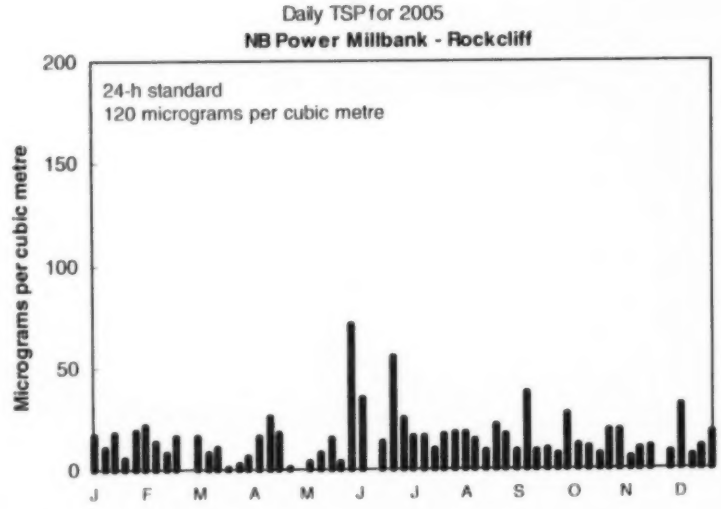

Daily TSP for 2005
NB Power Grand Lake - Newcastle Centre
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D

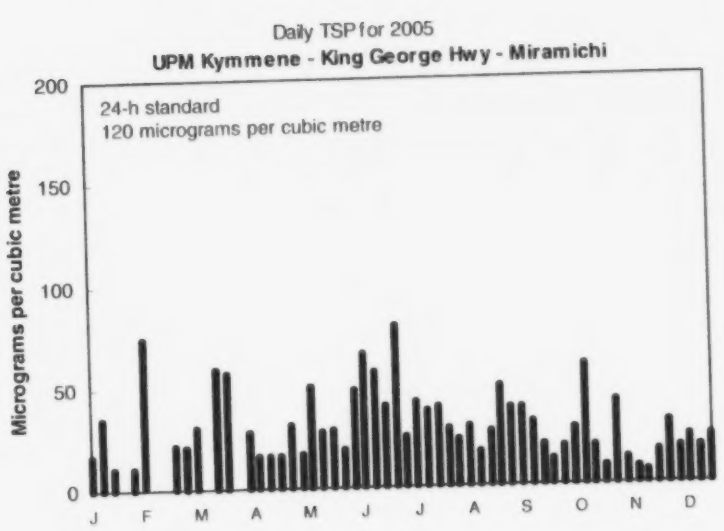

Daily TSP for 2005
NB Power Grand Lake - Cox Point
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D

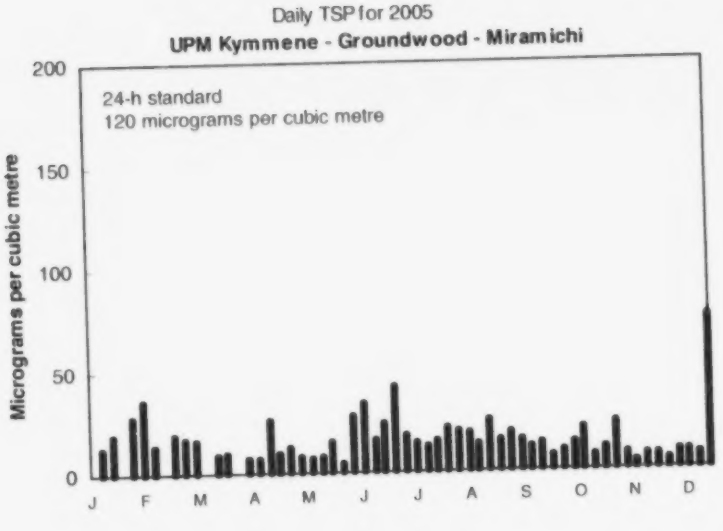

Daily TSP for 2005
NB Power Grand Lake - Bailey Point
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D

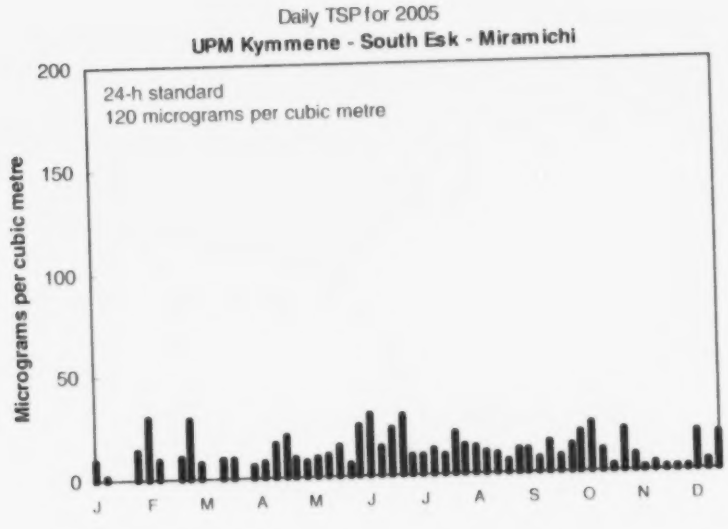

Daily TSP for 2005
Weyerhaeuser - Fire Ponds - Miramichi
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D

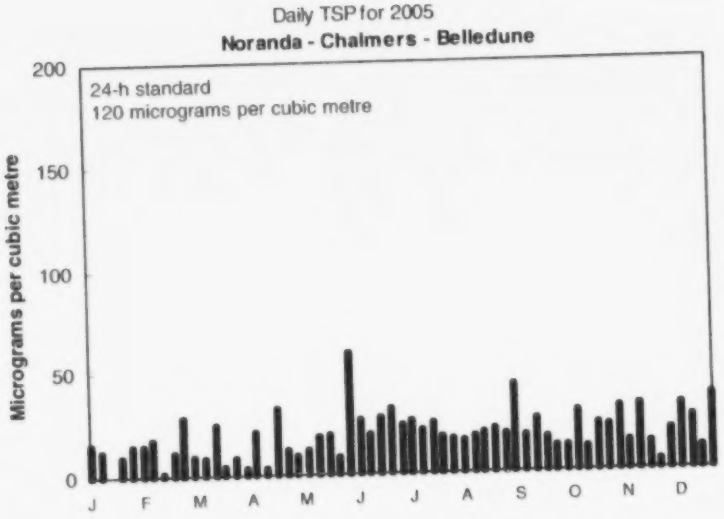

Daily TSP for 2005
Weyerhaeuser - Morrison Cove - Miramichi
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D


Daily TSP for 2005
NB Power Millbank - Rockcliff
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D


Daily TSP for 2005
UPM Kymmene - King George Hwy - Miramichi
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D

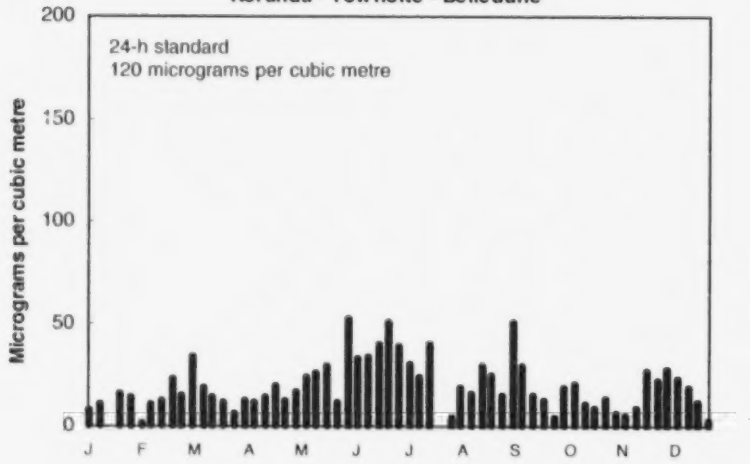

Daily TSP for 2005
UPM Kymmene - Groundwood - Miramichi
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D


Daily TSP for 2005
UPM Kymmene - South Esk - Miramichi
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D


Daily TSP for 2005
Noranda - Chalmers - Belledune
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D

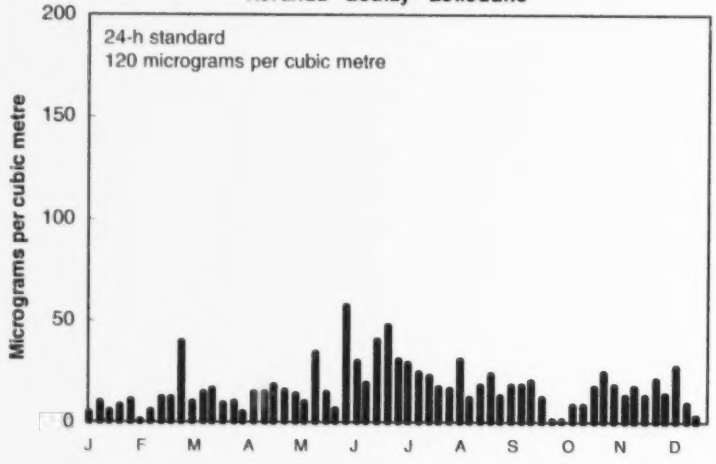
Daily TSP for 2005

Noranda - Townsite - Belledune



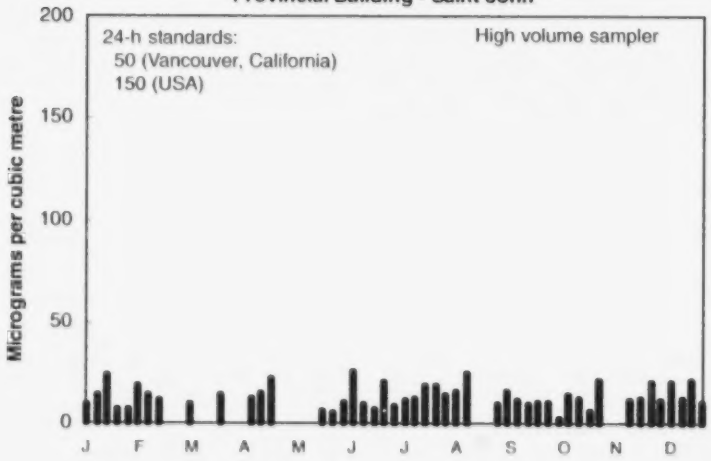
Daily TSP for 2005

Noranda - Boulay - Belledune



Daily PM10 for 2005

Provincial Building - Saint John



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